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A Guide for the Classification of Streptomycetes According to Selected Groups

Placement of Strains in Morphological Sections[1]

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In view of continued developments in antibiotic research and interest in streptomycete taxonomy over the past several years, we believe that an up-to-date compilation of the many-named species, together with designated antibiotics produced by antagonistic strains, would aid investigators in these areas of research. The reader will note also that the manuscript emphasizes the desirability of careful evaluation, maintenance, and preservation of strains of interest before assigning new species or antibiotic names. The results of our studies of original descriptions and of some of the strains listed herein clearly indicate that some investigators have ignored taxonomic treatises and have failed to carefully examine their strains through lack of knowledge of the techniques ideally suited for evaluation of these forms. Our results also suggest a logical and practical pattern to follow in developing a system for classification of the streptomycetes. Insofar as possible we have attempted to follow the International Code of Botanical Nomenclature. We have chosen to follow this code for two reasons. The International Bacteriological Code of Nomenclature provides only for the taxon *Subgenus* between the taxa *Genus* and *Species*. Because of the peculiar nature of streptomycete taxonomy, that is, the marked economic significance of these forms coupled with their substantial interest to both expert and novice, we believe that the creation of subgenera would only add more confusion. The International Code of Botanical Nomenclature, on the other hand, provides for a number of taxa between *Genus* and *Species*. In our opinion, placement of strains of the genus in *Sections* would effect the indicated subdivisions and yet retain the concept of a single inclusive genus. A second reason for following the Botanical Code rests on our belief that the streptomycetes more closely resemble the microfungi rather than the bacteria in their morphological and cultural habits. In order to clarify our views we have formalized four of the proposed sections with Latin descriptions and designations of type material and have included three additional sections that are not formalized. We believe that the material as presented herein should serve as a guide to both experts and novices in the taxonomic evaluation of strains of interest.

After more than a decade of intensive investigation of streptomycetes, microbiologists are still confronted with the difficult task of identifying strains of these microorganisms. Of particular concern is the problem of characterizing isolates so that they can be readily recognized later. Of further concern is the difficulty encountered in identifying unknown strains using the

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systems presently available. These difficulties have their origin in the development of keys based principally on physiological criteria. A résumé of the principal investigators and their criteria for classification is given in table 1.

Major reliance on physiological criteria for grouping and speciation in the genus has led to the creation of a large number of "*new species*" (more than 100 since the discovery of actinomycin in 1940). This trend will continue as long as new antibiotics or other interesting compounds are discovered as metabolic products of streptomycetes unless reliance is placed on more constant taxonomic characteristics. The continuing addition of new species is not surprising when one considers the marked physiological diversity demonstrated in this genus. In our opinion, many of the new species are no more than varieties or physiological forms of valid ones already described. Once studied and compared with valid species, some of the new species could undoubtedly be rejected or placed in synonymy.

After study of the pertinent literature and of numerous streptomycete isolates in the laboratory, we believe that the concept of speciation in the genus will be clarified, the inter- and intra-relationships of strains will be indicated more clearly, and ranges of variation within a particular group will be pointed out if more emphasis is given to the morphology of the sporophores of these forms. With primary emphasis on morphology, the species group concept, previously based on physiological criteria, may have a more stable foundation. Further differentiation of strains within each proposed "morphological section" could be brought about by a reevaluation of the many physiological tests now available and by the selection, for routine application, of those which appear to be most useful.

In a comprehensive study of a series of blue, blue-green or green-spored isolates, Hesseltine *et al.* (1954) suggested that cultures be collected and grouped in part on the basis of spore color. Subsequently, some difficulties were encountered in this approach and the present report relies heavily on the morphology of sporophores for the initial placement of strains.

In our studies over the past several years we have reached several conclusions that have influenced our concept of speciation in the genus. These are:

1. The morphology of the sporophores of a particular strain does not appreciably change on substrata that support optimal formation of aerial mycelium, sporophores, and spores. We have confirmed this fact time after time in our laboratory with a varied assortment of strains. We do not subscribe to statements that have been made from time to time indicating that morphological patterns exhibited by streptomycetes are subject to considerable variation. Unless degeneration of a particular strain has occurred through improper maintenance, the morphology of its sporophores can be determined with relative ease by direct observation of Petri plate cultures at magnifications ranging from 100 × to 500 ×. At lower magnifications the gross details of the sporophores can be established. At higher magnifications details of the spore chains can be clearly seen. The methods and media recommended for determining morphology of streptomycetes have been described elsewhere (Hesseltine *et al.*, 1954; Pridham *et al.*, 1957).

2. The genus *Streptomyces* can be subdivided into several distinct "*morphological sections.*" Following subculture of a streptomycete strain on Czapek's solution agar, Hickey and Tresner's "amidex" agar, and tomato-paste oatmeal agar, morphological examinations are made after two weeks' incubation at 28 to 30 C. If there remains a reasonable doubt with respect to placement of the strain in the proper section or if a more complete characterization is required, it also is subcultured on the following agar-containing media: Bennett's, inorganic salts-starch, yeast extract, tomato paste, potato glucose, Carvajal's oatmeal, and asparagine glucose (Pridham *et al.*, 1957).

3. Based on the color of the spores *en masse* (color of

TABLE 1

Principal workers and contributions to taxonomy of streptomycetes

Investigator	Criterion or Criteria Used	Number of Major Groups Proposed
Krainsky (1914)	Size of single-spore colonies	2
Waksman and Curtis (1916)	Proteolysis and formation of soluble pigment	4
Drechsler (1919)	Morphology of sporophores	(No defined groups)
Waksman (1919)	Formation of soluble pigment	2
Millard and Burr (1926)	Growth characteristics in glycerine synthetic solution	5
Jensen (1930)	Formation of soluble pigment	2
Duché (1934)	Cultural characteristics	(Several keys and groups)
Waksman and Henrici (1948)	Ecology and temperature requirements	4
Krassilnikov (1941, 1949)	Morphology of sporophores	2
Baldacci *et al.* (1953)	Color of vegetative mycelium	2
Baldacci *et al.* (1954)	Color of vegetative mycelium	2
Hesseltine *et al.* (1954)	Spore color and morphology of sporophores	8
Yamaguchi and Saburi (1955)	Morphology of sporophores	4
Gauze *et al.* (1957)	Color of aerial mycelium and color of vegetative mycelium	15

sporulating aerial mycelium at maturity), each morphological section of the genus can be further subdivided into "*series*." Each series can probably be further delineated, on the basis of physiological criteria, into groups of closely related forms that represent our present concept of "*species*." Additional delimitation then can be used to create "*varieties*" or "*physiological forms*," if need be.

4. Present concepts of the genus *Streptomyces* are being interpreted quite broadly by many investigators. Some of the strains of microorganisms identified as members of the genus may in reality belong to other genera of fungi. The solution of this problem awaits clarification of the taxonomy of these forms at the generic level.

If one considers the various morphological entities occurring in this genus, there is suggested a possible phylogenetic scheme for evolution of the various types

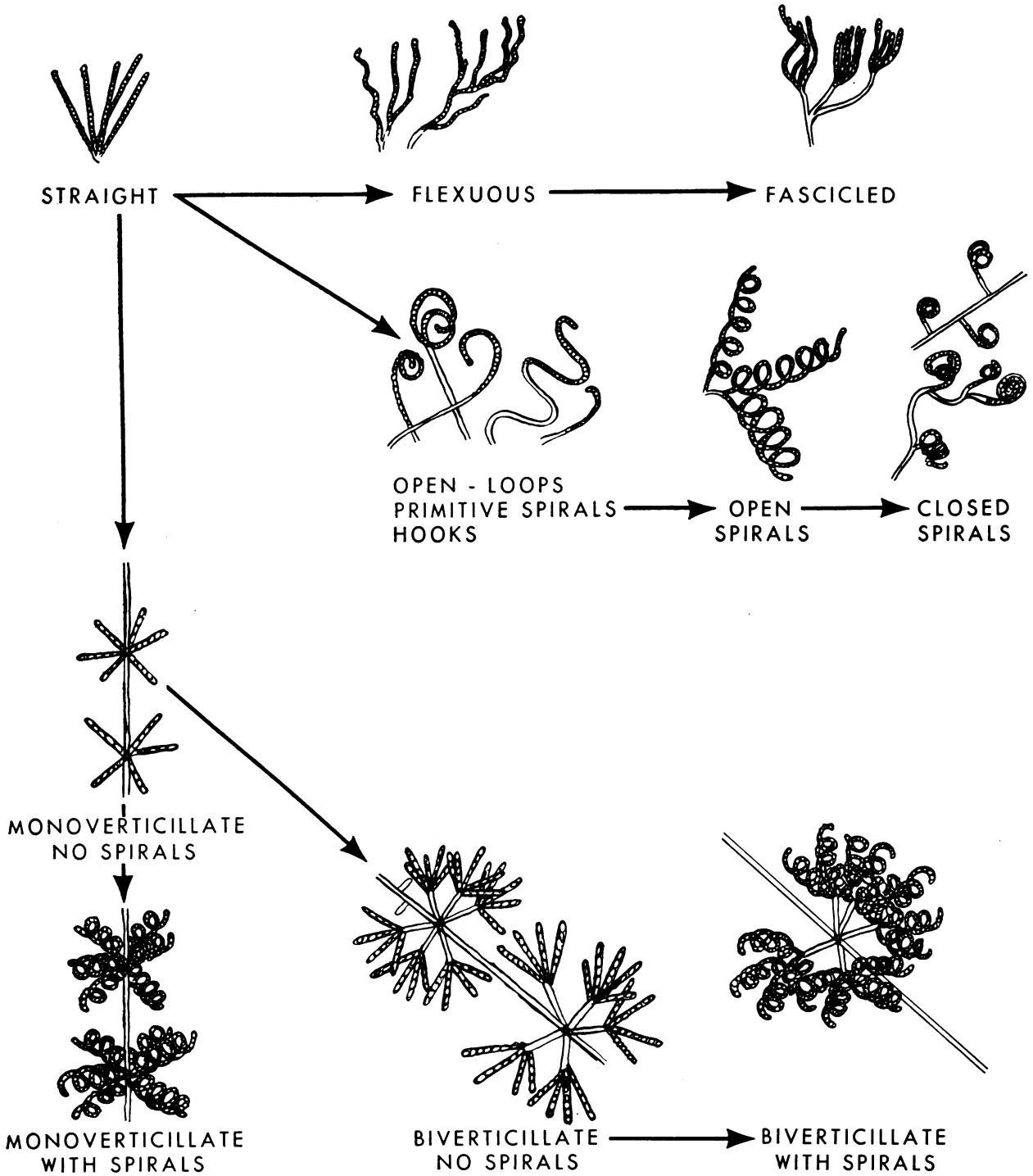


Figure 1. Suggested evolutionary development of morphological types in the genus *Streptomyces*

from a common ancestor characterized by extremely simple reproductive structures. Our conception of possible evolutionary trends in the genus is presented in figure 1.

Examination of figure 1 suggests an explanation for anomalies, which occasionally have been reported to occur for various species, for example, in some cases straight, hooked, and open-loop sporophores may be observed in a single culture. These strains may represent "intermediate" or "transition" forms evolving from the straight or flexuous types.

The proposed phylogenetic scheme admittedly is the result of speculation. It is included to more clearly define the system we are proposing. While it may not truly represent evolutionary stages in the streptomycetes, it does suggest a simple and practical pattern to follow in developing a more acceptable system for formal classification of these microorganisms.

Accordingly, we propose the subdivision of the genus *Streptomyces* into seven morphological sections. These are:

1. **Rectus-Flexibilis (RF).** Streptomycetes with straight, flexuous, or fascicled sporophores; no spirals (figure 2).
2. **Retinaculum-Apertum (RA).** Streptomycetes with sporophores as hooks, open-loops, or greatly extended (primitive) spirals (figure 3).
3. **Spira (S).** Streptomycetes with sporophores as either short, gnarled, or compact spirals or extended long and open spirals (figure 4).
4. **Monoverticillus (MV).** Streptomycetes with sporophores as primary verticils or whorls attached to long, straight branches; no spirals (figure 5).
5. **Monoverticillus-Spira (MV-S).** Streptomycetes with sporophores as primary verticils or whorls attached to long, straight branches; elements of verticils or whorls spiralled (figure 6).
6. **Biverticillus (BIV).** Streptomycetes with sporophores as compound verticils or whorls attached to long, straight branches; no spirals (figure 7).
7. **Biverticillus-Spira (BIV-S).** Streptomycetes with sporophores as compound verticils or whorls attached to long, straight branches; elements of secondary verticils or whorls spiralled (figure 8).

We have chosen to subdivide each section into six "series" based on spore color (color of sporulating aerial mycelium at maturity). These are:

1. White.
2. Olive-buff (buff to tan to olive-buff).
3. Yellow.
4. Blue (blue to blue-green to green).
5. Red (pink to red to lavender to lavender-gray).
6. Gray (light-gray to mouse-gray to brown-gray to gray-brown).

Three of the proposed sections (*Monoverticillus*, *Monoverticillus-Spira*, and *Biverticillus-Spira*) are in-

Figure 2. Section *Rectus-flexibilis*

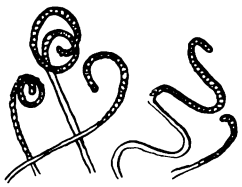


Figure 3. Section *Retinaculum-apertum*

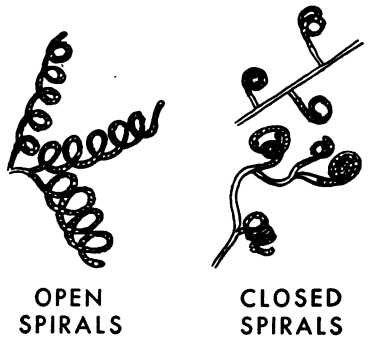


Figure 4. Section *Spira*

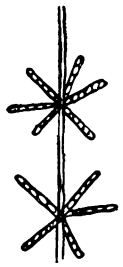


Figure 5. Section *Monoverticillus*

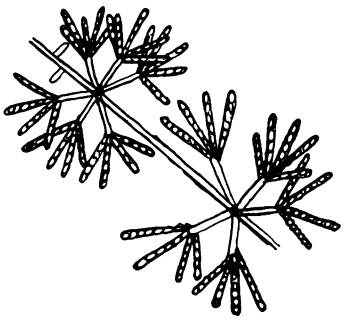
Figure 6. Section *Monoverticillus-spira*

cluded to develop an orderly morphological system for cataloging strains. Although our collection of streptomycetes contains no isolates that could be placed with certainty in any of these sections, there are allusions to these morphological types in the literature. In our opinion, these sections have no valid taxonomic status at present. While this treatment may seem somewhat presumptuous we believe that their inclusion will assist in clarifying some of the problems that arise in any discussion of taxonomic systems for the streptomycetes. These sections have not been formalized with Latin descriptions or with designations of type material.

The various morphological types which characterize each section are illustrated. The presence of more than one distinct type in some of the sections suggests further subdivision or the possibility that some of these are not streptomycetes. It is our hope that other investigators also will help to clarify this situation. The work involved is more than one person or a single team could accomplish in a reasonable time. Accordingly, the information and results presented are suggested as a guide for those who choose to study more precisely a selected group of strains or species.

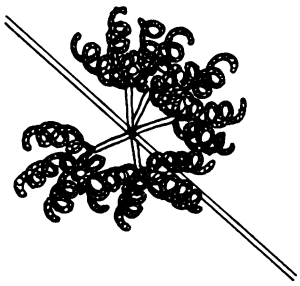
Each section description has a provisional guide to the series and component species and strains within the section. The guide is based on a rather thorough survey of original descriptions and/or illustrations, as well as on our study of some acquisitions.

Emphasis has been placed on cataloging individual strains since many descriptions studied indicate probable errors in identification and assignment of names. For that reason, the same specific epithet may be found in more than one section. Only those epithets in **Boldface Type** should be considered in a nomenclatural evaluation of the components of any one section.



BIVERTICILLATE
NO SPIRALS

Figure 7. Section *Biverticillus*



BIVERTICILLATE
WITH SPIRALS

Figure 8. Section *Biverticillus-spira*

Most of the named species of economic significance, as well as strains producing named antibiotics, are listed in the guide.

We believe that the strains listed in each section represent a group of organisms more closely related than groups selected by other criteria. Intensive study of the component strains in any one section should aid in clarifying some of the confusion now existent, in evaluating the synonymy of certain species, and in establishing the common identity of certain antibiotics. For example, examination of section *Retinaculum-Apertum* shows three named species: *S. virginiae* producing actithiazic acid, *S. acidomyceticus* producing acidomycin and aliomycin, and *S. cinnamonensis* producing cinnamonin. Acidomycin and cinnamonin since have been demonstrated to be chemically identical with actithiazic acid. We have examined strains of these three species and find that they are identical with regard to morphology and spore color. It is anticipated that these strains would exhibit similar carbon utilization patterns, as well as other similar physiological characteristics. The mycobacidin-producing strain of *S. lavendulae* probably would exhibit the same cultural characteristics since mycobacidin, too, has been identified as actithiazic acid. There also is the good possibility that all of these strains produce a second antibiotic identical with aliomycin. Other examples of this type are evident on study of the guide.

In the guide a check list of "unclassified" strains and species is included. The majority of the cultures listed as "unclassified" includes those for which descriptions are incomplete or absent, degenerates of available forms, or strains which are no longer available in any known culture collection. Their taxonomic status will remain questionable until some disposition is made of the inadequate original descriptions or until reliable type cultures can be obtained and studied.

Boldface Type designates the original species and/or strain description. All subsequent use of the specific epithet is printed in italics. Strains that we have studied are denoted with an asterisk (*) preceding the specific epithet.

Use of the guide should enable an investigator to determine with greater certainty the proper relationships of streptomycete strains of interest. The guide, of course, is subject to amendment and correction as more cultures are obtained and studied and as decisions are reached concerning the validity of certain species descriptions.

At present, we are using this system of classification, supported by the necessary biological and chemical

data, to determine the nature of promising antibiotic factors. Our results indicate that the system may have real merit in simplifying antibiotic screening work and in clarifying concepts of speciation in the genus *Streptomyces*.

ACKNOWLEDGMENTS

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SUMMARY

Subdivision of the genus *Streptomyces* into four distinct morphological sections is proposed as an aid in classification. Three additional sections are provisionally included to properly orient the reader. Each section is characterized by a distinctive morphology of the sporophores of mature cultures and is described and illustrated. More precise evaluation of the component strains of any one section should permit an investigator to determine the ranges of variation within species, clarify concepts of speciation within the genus and to reject, or place in synonymy, certain species.

A provisional guide to sections, based on morphology of sporophores, and to series, based on spore color, is included. Component species and strains in each series and section are listed. From study of the lists, it is apparent that numerous strains have been misidentified and that many species could be reduced to synonymy.

Key to Sections—Based Primarily upon Morphology

A. Streptomycetes with verticillate or whorled sporophores ..... B
AA. Streptomycetes with sporophores not verticillate or whorled ..... E
B. Streptomycetes with monoverticillate sporophores C
BB. Streptomycetes with biverticillate sporophores ..... D
C. Streptomycetes with monoverticillate sporophores; no spirals ..... Section **Monoverticillus**
CC. Streptomycetes with monoverticillate sporophores; elements of verticils or whorls spiralled .... Section **Monoverticillus-Spira**
D. Streptomycetes with biverticillate sporophores; no spirals ..... Section **Biverticillus**
DD. Streptomycetes with biverticillate sporophores; elements of secondary verticils or whorls spiralled Section **Biverticillus-Spira**
E. Streptomycetes with sporophores not verticillate, whorled, or spiralled, but straight, flexuous, or fascicled Section **Rectus-Flexibilis**
EE. Streptomycetes with sporophores not verticillate or whorled, but spiralled ..... F
F. Streptomycetes with sporophores not verticillate or whorled, but as either short, gnarled, or compact spirals, or extended long and open spirals ..... Section **Spira**
FF. Streptomycetes with sporophores not verticillate or whorled, but as hooks, open-loops, or greatly extended (primitive) spirals ..... Section **Retinaculum-Apertum**

GENUS STREPTOMYCES

Guide to Sections, Series, and Component Species and Strains

SECTION

RECTUS-FLEXIBILIS *sect. nov.*

Streptomycetes cum sporophora recta ad flexible. Typus Streptomyces griseus (Krainsky) Waksman et Henrici NRRL B-150, subnumero Waksman No. 9 in Culture Collection Northern Utilization Research and Development Division depositus.

Streptomycetes with straight, flexous, or fascicled sporophores. Typical strains: *Streptomyces griseus* (Krainsky) Waksman *et* Henrici, strain NRRL B-150 (flexous) [This strain is considered the type of the section] and *Streptomyces venezuelae* Ehrlich *et al.*, strain NRRL B-902 (straight).

Section epithet derived from the Latin "rectus" meaning "straight" and "flexibilis" meaning "flexuous."

SECTION

RECTUS-FLEXIBILIS (RF)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		WHITE SERIES	
abikoensum (is)	Z-1-6, Z-1-2, Z-1-3, Z-1-4, Z-1-8, Z-1-11, Z-1-14, Z-1-15, Z-3-6, Z-3-8, Z-5-11, and Z-6-4	Abikoviromycin	Japan. Med. J., **4**, 331, 1951; J. Antibiotics (Japan), **5**, 469, 1952; **5**, 477, 1952.
***albo-niger**	P638 (ATCC 12461)	Puromycin	Antibiotics & Chemotherapy, **2**, 409, 1952; Mycologia, **46**, 16, 1954; Can. Pat. 509,641, Feb. 1, 1955; U. S. Pat. 2,763,642, Sept. 18, 1956; U. S. Pat. 2,797,187, June 25, 1957.
albovinaceus			Gauze, G. F., *et al.*, 1957, Problems of Classification of Actinomycetes-Antagonists, National Press of Medical Literature, Medzig, Moscow, U.S.S.R., pp. 113 and 118.

SECTION
RECTUS-FLEXIBILIS (RF) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
beddardii	NCTC 4578 and NCTC 4579	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
blackwellii	NCTC 630		*Ibid.*
candidus	13		Krassilnikov, N. A., 1941, *The Guide to the Ray Fungi, Actinomycetales.*, Acad. Sci., Inst. of Microbiol., Moscow-Leningrad, U.S.S.R., p. 49; Krassilnikov, N. A., 1949, *Guide to the Identification of Bacteria and Actinomycetes.*, Acad. Sci., Inst. of Microbiol., Moscow-Leningrad, U.S.S.R., p. 100.
candidus *v.* **alboroseus**	4017/54, 4116/54, and 4143/54		Gauze *et al.* 1957, *op. cit.*, pp. 102 and 103.
coroniformis	16		Ann. Appl. Biol., **13,** 580, 1926.
dicksonii	NCTC 2083	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
elastica		Rubber deterioration	Centr. Bakteriol., Parasitenk., II Abt., **40,** 87, 1914.
farinosus	35, 49, 79, 303, and 308		Krassilnikov, 1941, *op. cit.*, pp. 9 and 50; 1949, *op. cit.*, pp. 46 and 124.
fordii	NCTC 4580 and NCTC 4581	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
globisporus			Krassilnikov, 1941, *op. cit.*, p. 48; 1949, *op. cit.*, p. 98.
globisporus albus	*S. albus* G of Welsch	Actinomycetin	Krassilnikov, 1949, *op. cit.*, p. 100.
globisporus diastaticus			Krassilnikov, 1941, *op. cit.*, p. 49; 1949, *op. cit.*, p. 99.
globisporus vulgaris			Krassilnikov, 1941, *op. cit.*, p. 49; 1949, *op. cit.*, p. 99.
griseoloalbus	1349/54, 1875/54, 3141/54, 3308/54, and 5999/54		Gauze *et al.*, 1957, *op. cit.*, pp. 112 and 113.
kimberi	NCTC 4576, NCTC 4577, NCTC 4583, and NCTC 4584	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
listeri	NCTC 434	Human pathogen	*Ibid.*
orientalis	M43-05865, M5-18215, and M5-18260	Vancomycin	Antibiotics Ann., **1955/56,** p. 606; Antibiotics & Chemotherapy, **6,** 642, 1956.
reticuli			Soil Sci., **1,** 99, 1916.
rhodnii	NCTC 4573		Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
rubescens	Z-5-2	Abikoviromycin	Japan. Med. J., **4,** 331, 1951; J. Antibiotics (Japan), **5,** 469, 1952.
sampsonii	8	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
thermophilus	S-type	Thermomycin	Antibiotics & Chemotherapy, **1,** 176, 1951.
vendargus		Oxytetracycline + vengicide	Australian Pat. 3985, Oct. 20, 1954.
sp.	F-6	Unidentified antibiotic	Antibiotics & Chemotherapy, **5,** 742, 1955.
	OLIVE-BUFF SERIES		
**albus*	G	Actinomycetin	Compt. rend. soc. belge biol., **126,** 244, 1937; J. Bacteriol., **42,** 801, 1941; **44,** 571, 1942; **53,** 101, 1947.
antibioticus	9	Streptothricin, group A	J. Antibiotics (Japan), **3,** 582, 1949/50 .
badius	1203/53, 4810/54, 7019/54, 10671/54, 11082/54, and 12098		Gauze *et al.*, 1957, *op. cit.*, pp. 78 and 87.
***canescus**	NRRL 2419	Ascosin	Antibiotics & Chemotherapy, **2,** 472, 1952; U. S. Pat. 2,723,216, Nov. 8, 1955.
cyaneofuscatus	92/54, 99/54, 624/53, 13366, and 14628/54		Gauze *et al.*, 1957, *op. cit.*, pp. 78 and 85.

SECTION
RECTUS-FLEXIBILIS (RF) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
******flavus*	3491	Actinomycin (X) B	Antibiotics & Chemotherapy, **4,** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955.
globisporus *v.* **caucasicus**	3794/54, 5553/54, and 13195/54		Gauze *et al.*, 1957, *op. cit.*, pp. 78 and 79.
globisporus *v.* **flavofuscus**	1140/54, 1565/53, 1803/54, 3875/54, 4824/54, 4833/54, 5586/54, 7104a, 11264, 11779/54, 13518, 13815, and 15232/54		Gauze *et al.*, 1957, *op. cit.*, pp. 78 and 81.
gracilis	7	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
griseus	3326 (original 1915 Waksman culture)		J. Bacteriol., **56,** 259, 1948.
griseus	Bucherer, CBS (3522)		J. Bacteriol., **56,** 259, 1948.
griseus	3526a (original 1915 Waksman culture deposited in Centraalbureau voor Schimmelcultures, Baarn)		*Ibid.*
griseus	3527	Grisein	*Ibid.*
griseus	3510	Antibiotic 3510 + unnamed antibiotic	Proc. Nat. Acad. Sci. U. S., **34,** 232, 1948; J. Bacteriol., **56,** 259, 1948.
******griseus*	G-25 (3478) (25-G)	Grisein + streptocin + vitamin B_{12}	Proc. Soc. Exp. Biol. Med., **64,** 50, 1947; J. Bacteriol., **59,** 523, 1950; U. S. Pat. 2,595,499, May 6, 1952.
******griseus*	18-16 (3463), D-1 (3464), 3481, and 3496	Streptomycin	Proc. Soc. Exp. Biol. Med., **55,** 66, 1944; **64,** 50, 1947; J. Bacteriol., **56,** 259, 1948.
******griseus*	3570	Candicidins A, B, and C	Mycologia, **45,** 155, 1953.
******griseus*	RM-241CR or SAW No. 4	Cycloheximide	J. Bacteriol., **52,** 610, 1946; **56,** 283, 1948; J. Am. Chem. Soc., **69,** 474, 1947.
griseus	A4903 (PD 04749, NRRL 2426)	Griseoviridin + viridogrisein	Antibiotics & Chemotherapy, **6,** 100, 1956.
griseus	5223	Sacromycin (amicetin)	J. Antibiotics (Japan), **8A,** 148, 1955.
griseus	A-2, A-3, A-10, A-12, A-13, A-15, A-16, A-17, A-18, A-21, A-26, A-28, A-29, A-30, A-31, A-34, A-35, A-37, B-10, B-24, B-27, C-6, C-10, C-16, and D-4	Various heptaene antibiotics (trichomycin-ascosin-candicidin type) with R_f's 0.22—0.29	Antibiotics Ann., **1955/56,** p. 249.
***griseus** *f.* **farinosus**	NRRL B-1354	Streptolins A and B, streptothricin + vitamin B_{12}	Bacteriol. Proc. Soc. Am. Bacteriologists, p. 18, 1954.
loidensis	10	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
marginatus	3	Plant pathogen	*Ibid.*
******olivochromogenes* or *viridochromogenes*	ETH 7796	Cycloheximide + nonactin	Helv. Chim. Acta, **38,** 1445, 1955.
praecox	20	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
praefecundus	4 and 12	Plant pathogen	*Ibid.*
rubiginosohelvolus	10/53, 3767/54, 11351, 12712, 14952/54, and 15494/54		Gauze *et al.*, 1957, *op. cit.*, pp. 78 and 89
setonii	2	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
***sindenensis**	1071	Amicetin	J. Antibiotics (Japan), **7B,** 168, 1954; Personal Communication, Nakazawa to Pridham, 1957.
streptomycini			Gauze *et al.*, 1957, *op. cit.*, pp. 78 and 84.
tenuis	5 and 6	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
******sp.*	A-35	Antimycins A_1, A_2, A_3, and A_4 (antimycin complex, antipiricullin, virosin)	Phytopathology, **37,** 14, 1947; **38,** 16, 1948; **38,** 899, 1948; **43,** 478, 1953; **44,** 438, 1954; Mycologia, **45,** 325, 1953; J. Am. Chem. Soc., **71,** 2436, 1949; U. S. Pat. 2,657,170, Oct. 27, 1953.
		YELLOW SERIES	
albo-flavus			Soil Sci., **1,** 99, 1916.
globisporus flaveolus			Krassilnikov, 1941, *op. cit.*, p. 49; 1949, *op. cit.*, p. 99.

SECTION
RECTUS-FLEXIBILIS (RF) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
griseoflavus	160	Griseoflavin	J. Antibiotics (Japan), **6A,** 66, 1953.
longissimus			Krassilnikov, 1941, *op. cit.*, p. 38; 1949, *op. cit.*, p. 82.
parvus	A-18	Actinomycin A	Arch. Biochem., **17,** 191, 1948.
**flavus*	3686 (NRRL B-1455)	Actinomycin I	Antibiotics & Chemotherapy, **4,** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955.
**parvus*	NRRL B-1455	Actinomycin I	Authors' data, 1956.
sp.		Actinomycin A	Compt. rend. soc. belge biol., **140,** 1157, 1946.
sp.	Ami 634, Halde 1160, Sötenich 3, and SV 1948	Actinomycin X complex	Arch. Mikrobiol., **18,** 327, 1953; **25,** 90 1956.
		BLUE SERIES	
***caeruleus**	1, 2, 3, and 4		Ist. botan. univ. Lab. crittogam., Pavia, Atti, 3 Ser. **5,** 180, 1944.
horton	NCTC 600	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
viridis			Riforma med., **19,** 1065, 1903.
viridis	9	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
sp.	XIII		Botan. Gaz., **67,** 147, 1919.
		RED SERIES	
**acidomyceticus*	2222	Acidomycin (actithiazic acid)	Personal Communication, Nakazawa to Pridham, 1957.
albosporeus	H-44	Vinacetin	J. Antibiotics (Japan), **6A,** 73, 1953.
cinnamonensis	A20 (IAUR)	Streptothricin-like antibiotic	Anais soc. biol. Pernambuco, **13,** 3, 1955; **14,** 9, 1956.
cinnamonensis *v.* **proteolyticus**	2195/54, 7082/54, 11579, 11932, and 14013		Gauze *et al.*, 1957, *op. cit.*, pp. 59 and 63.
diastaticus			Giorn. microbiol., **1,** 127, 1955.
diastaticus *v.* **venezuelae**	Gottlieb's 8-44	Chloramphenicol	*Ibid.*
erythrochromogenes	W-115-C	Sarkomycins E_1, E_2, S_1, S_2, and S_3	J. Antibiotics (Japan), **6A,** 153, 1953; **9B,** 104, 1956; **9B,** 107, 1956; **9B,** 110, 1956.
filamentosus	1-C-9	Caryomycin	J. Antibiotics (Japan), **6A,** 153, 1953.
flavotricini			Gauze *et al.*, 1957, *op. cit.*, pp. 44 and 49.
floridae	A5014	Viomycin	Am. Rev. Tuberc., **63,** 4, 1951; **63,** 7, 1951; Bull. Torrey Botan. Club, **82,** 108, 1955.
fradiae	T59	Framycetin	Ann. pharm. franç., **12,** 440, 1954.
fradiae	H-702	Unidentified antibiotics	J. Antibiotics (Japan), **4,** 317, 1951.
fradii			Soil Sci., **1,** 99, 1916.
fragilis	C1437 (PD 04926) and C10076	Azaserine	Nature, **173,** 71, 1954; Antibiotics & Chemotherapy, **6,** 100, 1956.
fuscus		Rubber deterioration	Centr. Bakteriol., Parasitenk., II Abt., **40,** 87, 1914.
garyphalus	106-7, 190-8, 190-9, 190-33, 540-33, and 540-34	D-4-amino-3-isoxazolidone (oxamycin, cycloserine, antibiotic PA 94)	Antibiotics & Chemotherapy, **5,** 183 1955; J. Am. Chem. Soc., **77,** 2344 1955; **77,** 2346, 1955.
**griseus*	3495	Rhodomycetin (formerly rhodomycin)	Antibiotics & Chemotherapy, **1,** 68, 1951.
griseus *v.* **purpureus**			Bull. Torrey Botan. Club, **82,** 108, 1955;
vinaceus	Ciba		Ger. Pat. 834,582, Mar. 20, 1952; Am.
puniceus	1314-5	Viomycin (vinactins A, B, and C)	Rev. Tuberc., **63,** 4, 1951; **63,** 7, 1951.
floridae	PD A5014		
**californicus*	ATCC 3312		
lavendulae-like	A-82	Antismegmatis antibiotic	Proc. Soc. Exp. Biol. Med., **63,** 227, 1946.
lavendulae	3483	Streptothricin-resistant	J. Bacteriol., **62,** 149, 1951.
lavendulae or *reticulus-ruber*	3445	Streptin	J. Bacteriol., **52,** 502, 1946; **62,** 149, 1951.

SECTION

RECTUS-FLEXIBILIS (RF) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
lavendulae	3440-8 and 3440-14	Original streptothricin	Soil Sci., **54,** 281, 1942; J. Bacteriol., **62,** 149, 1951; U. S. Pat. 2,443,485, June 15, 1948; Can. Pat. 481,107, Feb. 12, 1952.
**lavendulae*	272	Pleocidin and pleocidin A	Antibiotics & Chemotherapy, **2,** 307, 1952.
**lavendulae*	7K1 (IAUR)	Eurimicin	Anais soc. biol. Pernambuco, **14,** 68, 1956.
nitrosporeus	0-20	Nitrosporin (proactinomycin?)	J. Antibiotics (Japan), **5,** 270, 1952; **5,** 477, 1952; **9B,** 160, 1956.
oidiosporus	90 and 281		Krassilnikov, 1941, *op. cit.*, pp. 10 and 23; 1949, *op. cit.*, pp. 48 and 65.
omiyaensis	102	Chloramphenicol	Japan. Med. J., **1,** 358, 1948; J. Antibiotics (Japan), **3,** 292, 1949/50.
**pheochromogenus*	C-8γ	Chloramphenicol	Personal Communication, Nakazawa to Pridham, 1957.
racemochromogenus	229	Antibiotics 229 and 229B	J. Antibiotics (Japan), **9B,** 170, 1956.
rangoon			Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
rectus			Krassilnikov, 1949, *op. cit.*, p. 65.
rochei	NRRL B-1559	Borrelidin	Arch. Biochem., **22,** 476, 1949.
roseochromogenus	0-36	Roseomycin (streptothricin I, streptothricin type 1)	J. Antibiotics (Japan), **3,** 845, 1949/50; **4,** 24, 1951.
roseochromogenus or *virginiae*	T 4473	Unidentified antibiotic	Ann. pharm. franç., **12,** 440, 1954.
roseofulvus			Gauze *et al.*, 1957, *op. cit.*, pp. 53 and 55.
roseolus			Gauze *et al.*, 1957, *op. cit.*, pp. 32 and 37.
roseoviridis			Gauze *et al.*, 1957, *op. cit.*, pp. 53 and 57.
ruber	13A	Streptothricin, group A	J. Antibiotics (Japan), **3,** 582, 1949/50.
syringini			Gauze *et al.*, 1957, *op. cit.*, p. 32.
umbrinus	1703/53, 1706/53, 8697/54, and 9287/54		Gauze *et al.*, 1957, *op. cit.*, pp. 59 and 62.
venezuelae	A65 (PD 04745) and 8-44	Chloramphenicol	J. Bacteriol., **56,** 467, 1948; U. S. Pat. 2,483,871, Oct. 4, 1949.
venezuelae	3534 and 3534a	Chloramphenicol	J. Bacteriol., **62,** 149, 1951.
**vinaceus*	NRRL 2285	Viomycin (vinactins A, B, and C)	Proc. Intern. Congr. Pure and Appl. Chem., 12th Congr., pp. 283 and 284, 1951; U. S. Pat. 2,633,445, Mar. 31, 1953; Brit. Pat. 651,269, Mar. 19, 1951; Can. Pat. 508,115, Dec. 14, 1954; Bull. Torrey Botan. Club, **82,** 108, 1955.
**sp.*	A58	Phagolessin A58	Antibiotics & Chemotherapy, **2,** 366, 1952.
sp.	8, 9, 12, and 13	Thioaurin	Abst. 122nd Meet., Am. Chem. Soc., p. 12A, 1952; Antibiotics & Chemotherapy, **3,** 382, 1953; U. S. Pat. 2,749,273, June 5, 1956.
sp.	K-125a	Unidentified antibiotic	J. Antibiotics (Japan), **7A,** 61, 1951; **7B,** 4, 1951.
sp.	XVI		Botan. Gaz., **67,** 147, 1919.
**sp.*	700	Streptothricin	J. Antibiotics (Japan), **2,** 273, 1948/49; Personal Communication, Nakazawa to Pridham, 1957.
		GRAY SERIES	
alba	X		Botan. Gaz., **67,** 147, 1919.
alboflavus or *griseoflavus*	3560	Oxytetracycline + rimocidin	Bacteriol. Proc. Soc. Am. Bacteriologists, p. 30, 1951; Proc. Nat. Acad. Sci. U. S., **38,** 583, 1952.
albus	T-12	Albomycetin	J. Antibiotics (Japan), **7A,** 149, 1954.

SECTION

RECTUS-FLEXIBILIS (RF) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
antibioticus		Actinomycin A and B	J. Bacteriol., **42,** 231, 1941; U. S. Pat. 2,378,876, June 19, 1945.
antibioticus	3439, 3682, and 3684	Actinomycin A	Antibiotics & Chemotherapy, **4,** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955.
**antibioticus* (*flavus*)	A-1383	Actinomycin A	J. Antibiotics (Japan), **3,** 363, 1949/50.
antibioticus	3436	Actinomycin I	Antibiotics & Chemotherapy, **4,** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955.
**antibioticus*	15784-1 (ATCC 11891)	Oleandomycin	U. S. Pat. 2,757,123, July 31, 1956.
antibioticus	89-C-2	Actinone (saccharomycetin?)	J. Antibiotics (Japan), **3,** 271, 1949/50; **3,** 726, 1949/50.
***bikiniensis**	3515	Streptomycin II	J. Bacteriol., **55,** 317, 1948.
caiusiae		Unidentified antibiotic	J. Sci. Industr. Res. (India), **16C,** 76, 1957.
carnosus	1	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
**californicus*	Di-10 (IAUR)	Unidentified antibiotic	Anais soc. biol. Pernambuco, **14,** 1, 1956.
chrysomallus	1a	Actinochrysin (actinomycins C_1, C_2, C_3, and C_4)	Arch. Mikrobiol., **17,** 361, 1952; **18,** 327, 1953; Naturwiss., **35,** 376, 1949; **37,** 494, 1950; **39,** 429, 1952; Chem. Ber., **84,** 260, 1951; **87,** 1036, 1954; Z. physiol. Chem., Hoppe-Seyler's **292,** 77, 1953.
cinnabarinus			Gauze *et al.*, 1957, *op. cit.*, pp. 186 and 196.
clavifer	18 and 19	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
craterifer	22	Plant pathogen	*Ibid.*
cylindrosporus	62 and 142		Krassilnikov, 1941, *op. cit.*, pp. 10 and 56; 1949, *op. cit.*, pp. 49 and 108.
eurythermus	ETH 6677, ETH 6905, and ETH 7489	Angolamycin	Helv. Chim. Acta, **38,** 1202, 1955.
fasciculus	88 and 120		Krassilnikov, 1941, *op. cit.*, p. 50; 1949, *op. cit.*, p. 101.
fasciculus	H-3882	Anti-*Trichomonas* antibiotic	J. Gen. Appl. Microbiol. (Japan), **1,** 201, 1955.
***felleus**	Stamm 326, Gütt 467, and Bo105	Picromycin	Arch. Mikrobiol., **17,** 361, 1952; Chem. Ber., **84,** 284, 1951; U. S. Pat. 2,693,433, Nov. 2, 1954; Brit. Pat. 682,045, Nov. 5, 1952.
flaveolus *v.* **rectus**	3358, 3959, 4624/54, 10294, and 11187		Gauze *et al.*, 1957, *op. cit.*, pp. 151 and 153.
fulvissimus	H.I., T.XIV, H.X., R.V., and V.XXII		Soil Sci., **30,** 59, 1930.
fumosus			Krassilnikov, 1941, *op. cit.*, p. 58; 1949, *op. cit.*, p. 109.
globisporus circulatus			Krassilnikov, 1949, *op. cit.*, p. 99.
globisporus griseus			Krassilnikov, 1941, *op. cit.*, p. 49; 1949, *op. cit.*, p. 99.
globisporus scabies			Krassilnikov, 1949, *op. cit.*, p. 100.
globisporus streptomycini (Waksman's *S. griseus*)		Streptomycin	*Ibid.*
globosus			Krassilnikov, 1941, *op. cit.*, p. 58; 1949, *op. cit.*, p. 109.
†**griseolus**	96		Soil Sci., **8,** 71, 1919.
griseolus	E-424	Phagomycin	J. Antibiotics (Japan), **9A,** 108, 1956.
griseolus	587	Fermicidin	J. Antibiotics (Japan), **7B,** 221, 1954.
griseorubiginosus			Gauze *et al.*, 1957, *op. cit.*, pp. 186 and 193.
kitazawaensis	21-A-2 and 48-B-3	Antimycin A + carzinocidin	J. Antibiotics (Japan), **9A,** 63, 1956; **9A,** 113, 1956.
lipmanii			Soil Sci., **1,** 99, 1916.

† Designated by strain number only in original publication and subsequently assigned specific epithet in various editions of *Bergey's Manual of Determinative Bacteriology*, The Williams & Wilkins Co., Baltimore, Maryland.

SECTION
RECTUS-FLEXIBILIS (RF) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
noboritoensis		Homomycin (hygromycin) + blastomycin	J. Antibiotics (Japan), **8A,** 170, 1955; **9A,** 225, 1956; **10A,** 21, 1957.
†olivaceus	206		Soil. Sci., **8,** 71, 1919.
******olivaceus*	NRRL B-1125	Vitamin B_{12} + olivacein	Appl. Microbiol., **1,** 124, 1953.
olivaceus	15920-19 (ATCC 12019)	Antibiotics PA 114A and PA 114B	Antibiotics Ann., **1955/56,** p. 437; U. S. Pat. 2,787,580, Apr. 2, 1957.
olivaceus	ETH 7437	Granaticin	Helv. Chim. Acta, **40,** 1262, 1957.
phaeochromogenus	788-A2	Ractinomycins A and B + unnamed antifungal antibiotic	J. Antibiotics (Japan), **8A,** 132, 1955; **10A,** 115, 1957.
******pheochromogenus*	C-2009 and C-3β	Chloramphenicol	Personal Communication, Nakazawa to Pridham, 1957.
pheochromogenus *v.* **chloromyceticus**	0-163	Chloramphenicol	J. Antibiotics (Japan), **2,** 593, 1948/49.
prunicolor	3871/54, 4168/54, and 7644/54		Gauze *et al.*, 1957, *op. cit.*, pp. 179 and 184.
***purpeofuscus**	H-5080	Anti-*Trichomonas* antibiotic	J. Gen. Appl. Microbiol. (Japan), **1,** 201, 1955.
purpurogenus			Soil Sci., **1,** 99, 1916.
***tanashiensis** (*aureus*)	63-3 and 144	Luteomycin	J. Antibiotics (Japan), **3,** 313, 1949/50; **5,** 529, 1952; Kitasato Arch. Exp. Med., **22,** 229, 1949.
thermophilus	1	Thermophile	Z. Hyg. Infektionskrankh., **47,** 383, 1904.
thermophilus	1, 2, 3, 5, 7, 12, 14, 15, 18, 19, and 20	Thermophile	Soil Sci., **47,** 37, 1939.
violaceus-niger			Soil Sci., **1,** 99, 1916.
violaceorectus			Gauze *et al.*, 1957, *op. cit.*, pp. 179 and 182.
viridogenes	Millard and Burr 9		*Actinomycetes and their antibiotics*, Williams and Wilkins, Baltimore, 1953, p. 109.
wedmorensis	15		Ann. Appl. Biol., **13,** 580, 1926.
zaomyceticus	N-187	Zaomycin	J. Antibiotics (Japan), **7A,** 134, 1954.
sp.	36-G	Actinomycin	Proc. Nat. Acad. Sci. U. S., **32,** 117, 1946.
sp.	3687	Actinomycin B complex	Science, **120,** 389, 1954; Antibiotics & Chemotherapy, **4,** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955.
sp.	2A-720 and 6A-369	Antimycin A + antibiotic 720B	J. Antibiotics (Japan), **9A,** 1, 1956.
sp.	M-2140	Methymycin + neomethymycin	Antibiotics Ann., **1953/54,** p. 179; J. Am. Chem. Soc., **79,** 2022, 1957.
sp.	A_{12}	Rubidin	Antibiotics Ann., **1955/56,** p. 640.
******sp.*	NA364-A24, NA4-M40, and NA4-X8	Aureolic acid	Antibiotics & Chemotherapy, **3,** 1215, 1953.
sp. (*purpeochromogenus?*)	A-83	Unidentified antifungal antibiotic	J. Antibiotics (Japan), **4,** 357, 1951.
sp.	EI_5	Antibiotic EI_5	Proc. Soc. Exp. Biol. Med., **72,** 283, 1947.
sp.	145		Soil Sci., **8,** 71, 1919.
sp.	Bostroem		Beitr. pathol. Anat. u. allgem. Pathol., **9,** 1, 1890/91.
sp.	F-300	Phagostatin	J. Antibiotics (Japan), **10A,** 74, 1957.
	SERIES UNKNOWN		
casei		Thermophile	J. Bacteriol., **27,** 625, 1934.
fasiculatus		Amicetin	Antibiotics & Chemotherapy, **3,** 718, 1953.
globisporus lactis			Krassilnikov, 1941, *op. cit.*, p. 49; 1949, *op. cit.*, p. 99.
rubescens			Boll. sez. ital. soc. intern. microbiol., **3,** 43, 1931.

SECTION
RETINACULUM-APERTUM *sect. nov.*

Streptomycetes cum sporophora in formae unci, spirae pristinae, et retinaculi aperti. Typus Streptomyces fradiae (Waksman et Curtis) Waksman et Henrici NRRL B-1195, sub numero Waksman 3535 in Culture Collection Northern Utilization Research and Development Division depositus.

Streptomycetes with sporophores in the form of hooks, open-loops, or greatly extended (primitive) spirals. Open loops generally of large diameter with one, two, or three coils. Type: *Streptomyces fradiae* (Waksman *et* Curtis) Waksman *et* Henrici, strain NRRL B-1195 (Waksman 3535).‡

Section epithet derived from the Latin "retinaculum" meaning "loop" and "apertus" meaning "open."

‡ The facts that this strain falls in Section *Retinaculum-Apertum* and has been designated as the type of the Section and that the original description for *Streptomyces fradiae* places the species in Section *Rectus-Flexibilis* indicates to us that either the original description (Waksman and Curtis, 1916) and Waksman's subsequent treatments in 1919 and 1953 should be emended to more closely conform with the characteristics of this strain or, that the strain Waksman now designates as the type of *S. fradiae* is, in fact, a strain of another species. We believe that the description of this species should be emended since Waksman's strain is available and is a well known culture.

SECTION
RETINACULUM-APERTUM (RA)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		WHITE SERIES	
cacaoi	III (203H)		Ann. Appl. Biol., **19,** 515, 1932.
		OLIVE-BUFF SERIES	
celluloflavus	39a	Aureothricin	J. Antibiotics (Japan), **6A,** 57, 1953.
		YELLOW SERIES	
		BLUE SERIES	
caelestis		Celesticetin	Antibiotics Ann., **1954/55,** p. 831.
		RED SERIES	
***acidomyceticus**	A	Acidomycin (actithiazic acid, thiazolidone antibiotic, mycobacidin, cinnamonin) + aliomycin	J. Antibiotics (Japan), **6A,** 158, 1953; **9B,** 101, 1956; Ann. Rept. Takeda Pharm. Ind., Ltd., **13,** 78, 1954.
***cinnamonensis**	154-T-3	Cinnamonin (actithiazic acid, acidomycin, thiazolidone antibiotic, mycobacidin)	J. Antibiotics (Japan), **5,** 572, 1952; **9B** 62, 1956.
**erythreus*	NRRL 2338	Erythromycins A and B	Antibiotics & Chemotherapy, **2,** 281, 1952; U. S. Pat. 2,653,899, Sept. 29 1953; J. Am. Chem. Soc., **76,** 569, 1954.
**fradiae*	3535	Neomycins A, B, and C (fradiomycin, streptothricins BI and BII) + fradicin and steroid conversion	Science, **109,** 305, 1949; Arch. Biochem., **24,** 92, 1949; Proc. Soc. Exp. Biol. Med., **73,** 376, 1950; J. Am. Chem. Soc., **74,** 2381, 1952; J. Biol. Chem., **203,** 807, 1953; U. S. Pat. 2,799,620, July 16, 1957.
fradiae *v.* **spiralis**			Gauze *et al.*, 1957, *op. cit.*, pp. 51 and 53.
***griseoluteus**	p-37 (P-37)	Griseoluteins A and B	J. Antibiotics (Japan), **4,** 34, 1951; **5,** 477, 1952; **6A,** 139, 1953; **7A,** 15, 1954.
***griseoruber**	H-4650	Anti-*Trichomonas* antibiotic	J. Gen. Appl. Microbiol. (Japan), **1,** 201, 1955; J. Antibiotics (Japan), **9B,** 62, 1956; **9B,** 120, 1956.
**lavendulae*	8197-20 (ATCC 11924)	Antibiotic PA 94 (D-4-amino-3-isoxazolidone, cycloserine, oxamycin)	Brit. Pat. 715,362, Sept. 15, 1954; Antibiotics & Chemotherapy, **5,** 398, 1955; U. S. Pat. 2,773,878, Dec. 11, 1956.
**lavendulae*	C221 (3555 and 3555a)	Ehrlichin?	J. Bacteriol., **62,** 149, 1951; J. Immunol., **67,** 471, 1951; Bacteriol. Proc. Soc. Am. Bacteriologists, p. 29, 1951.
lavendulae		Framycetin (antibiotic EF 185)	Ann. pharm. franç., **11,** 44, 1953; **11,** 440, 1953.
**lavendulae*	3516	Streptothricin VI (SVI)	Arch. Biochem., **22,** 16, 1949; J. Bacteriol., **62,** 149, 1951.
longisporus ruber	10, 38, 184, 384, 424, and 430		Krassilnikov, 1941, *op. cit.*, pp. 22 and 27; 1949, *op. cit.*, pp. 47 and 62.
***roseoflavus**	320	Flavomycin + mycelin	J. Antibiotics (Japan), **4,** 215, 1951; **5,** 217, 1952.

SECTION
RETINACULUM-APERTUM (RA) (*Continued*)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
***rubrocyano-diastaticus** *v.* **piger**	170 and 307		Giorn. microbiol., **1,** 127, 1955.
***vinaceus**	8542-1	APF (vitamin B_{12})	Papers Mich. Acad. Sci., **37,** 47, 1952; U. S. Pat. 2,681,881, June 22, 1954.
***virginiae**	NA255-B8, NA255-M15P, NA225-M15W, NA255-M19, and NA255-M25	Actithiazic acid (mycobacidin, thiazolidone antibiotic, acidomycin, cinnamonin)	Antibiotics & Chemotherapy, **2,** 399, 1952; U. S. Pat. 2,678,929, May 18, 1954.
**sp.*	A-105	Actinorubin	J. Bacteriol., **53,** 695, 1947.
**sp.*	11	Streptolin + streptothricin	J. Am. Chem. Soc., **69,** 3006, 1947; **69,** 3145, 1947.
		GRAY SERIES	
acrimycini	698/53, 3964/54, 6683, 6712, 7699, 7764, 7977, and 10342		Gauze *et al.*, 1957, *op. cit.*, p. 140.
ambofaciens	1142 and 3486	Spiramycin + congocidin (netropsin)	Compt. rend., **234,** 1498, 1952; Ann. inst. Pasteur, **87,** 702, 1954; Antibiotics Ann., **1954/55,** p. 724; **1955/56,** p. 223; Abstr. 131st. Meeting Am. Chem. Soc., p. 22N, 1957.
***aureofaciens**	A-377	Chlortetracycline	Ann. N. Y. Acad. Sci., **51,** 177, 1948; U. S. Pat. 2,482,055, Sept. 13, 1949.
**aureofaciens*	NRRL B-1286, NRRL B-1287, and NRRL B-1288	Chlortetracycline + tetracycline	Authors' data, 1956.
**aureofaciens*	HA-20 (ATCC 12416-a)	Tetracycline + chlortetracycline	U. S. Pat. 2,734,018, Feb. 7, 1956.
aureus	3569	Fungicidin-like antibiotic	Antibiotics & Chemotherapy, **2,** 179, 1952.
cacaoi	H-2075	Unidentified antibiotic	J. Antibiotics (Japan), **7A,** 10, 1954.
canus		Amphomycin	Antibiotics & Chemotherapy, **3,** 1239, 1953.
diastatochromogenes		Oligomycins A, B, and C	Antibiotics & Chemotherapy, **4,** 962, 1954; Bacteriol. Proc. Soc. Am. Bacteriologists, p. 28, 1957.
†flaveolus	168		Soil Sci., **8,** 71, 1919.
flavochromogenes	T349-15	Amaromycin	J. Antibiotics (Japan), **8A,** 9, 1955; **9B,** 160, 1956.
flavus-parvus group *sp.*	3687	Actinomycin (X) B	Antibiotics & Chemotherapy, **4;** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955.
gelaticus (*hepaticus*)	C2828 (PD 04942)	Elaiomycin	Antibiotics & Chemotherapy, **4,** 141, 1954; **4,** 338, 1954; **6,** 100, 1956.
griseorubens			Gauze *et al.*, 1957, *op. cit.*, pp. 140 and 144.
griseostramineus			Gauze *et al.*, 1957, *op. cit.*, pp. 151 and 155.
litmocidini			Gauze *et al.*, 1957, *op. cit.*, pp. 186 and 187.
***noursei**	48240 (ATCC 11455)	Fungicidin (nystatin) + cycloheximide-like antibiotic	Proc. Soc. Exp. Biol. Med. **76,** 93, 1951; Brit. Pat. 714,189, Aug. 25, 1954; U. S. Pat. 2,797,183, June 25, 1957.
olivaceoviridis			Gauze *et al.*, 1957, *op. cit.*, pp. 163 and 164.
***phaeofaciens**	T-23	Phaeofacin	J. Antibiotics (Japan), **5,** 465, 1952.
plicatus	PD 04918	Antibiotics C and D	Brit. Pat. 707,332, April 14, 1954.
pyridomyceticus (*albidofuscus*)	451-A8	Pyridomycin	J. Antibiotics (Japan), **6A,** 140, 1953; **7A,** 55, 1954; **8A,** 201, 1955; **10A,** 94, 1957.
violaceus *v.* **rubescens**	962/54, 2498/54, 5839/54, 7085/55, 11508/54, 12194, and 13647		Gauze *et al.*, 1957, *op. cit.*, pp. 179 and 181.
***viridifaciens**	BL 567201 (ATCC 11989)	Tetracycline	U. S. Pat. 2,712,517, July 5, 1955.
		SERIES UNKNOWN	

SECTION

SPIRA *sect. nov.*

Streptomycetes cum sporophora spira. Typus Streptomyces viridochromogenes (Krainsky) Waksman et Henrici NRRL B-1511, subnumero CBS (Millard) in Culture Collection Northern Utilization Research and Development Division depositus.

Streptomycetes with spiral sporophores either as short, gnarled, or compact spirals or extended long and open spirals. Typical strains: *Streptomyces viridochromogenes* (Krainsky) Waksman *et* Henrici, strain NRRL B-1511 (extended long and open spirals) [This strain is considered the type of the section] and *Streptomyces hygroscopicus* (Jensen) Waksman *et* Henrici, strain NRRL B-1346 (short, gnarled, or compact spirals).

Section epithet derived from the Latin "spira" meaning "a coil or twist."

SECTION

SPIRA (S)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		WHITE SERIES	
albidus *v.* **invertens**	5242/54, 8260/54, and 11792/54		Gauze *et al.*, 1957, *op. cit.*, pp. 113 and 115.
alborubidus			Gauze *et al.*, 1957, *op. cit.*, pp. 102 and 109.
******albus*	ATCC 618		Authors' data, 1956.
albus	91 and 284	Streptothricin, group A	J. Antibiotics (Japan), **3,** 582, 1949/50.
albus vulgaris			Krassilnikov, 1949, *op. cit.*, p. 85.
albus chlamydosporus			Krassilnikov, 1949, *op. cit.*, p. 87.
armillatus		Oxytetracycline	Ann. inst. Pasteur, **87,** 580, 1954.
cacaoi	II(203F)	Plant pathogen	Ann. Appl. Biol., **19,** 515, 1932.
†erythreus	161		Soil Sci., **8,** 71, 1919.
galtieri			Ann. parasitol. humaine et comparée., **26,** 118, 1951.
longisporus	50, 82, 145, 164, 309, and 317		Krassilnikov, 1941, *op. cit.*, p. 47; 1949 *op. cit.*, p. 97.
***rimosus**	S3279	Oxytetracycline + rimocidin (antibiotic PA 85)	Science, **111,** 85, 1950; Antibiotics & Chemotherapy, **1,** 289, 1951; U. S. Pat. 2,516,080, July 18, 1950; Brit. Pat. 718,-021, Nov. 10, 1954.
rimosus	4622-21	Antibiotic PA 86	Brit. Pat. 719,878, Dec. 8, 1954.
violaceus-caeseri			Soil Sci., **1,** 99, 1916.
		OLIVE-BUFF SERIES	
abikoensum *v.* **spiralis**	5645, 5796, 5995, 6355, and B-516		Gauze *et al.*, 1957, *op. cit.*, pp. 92 and 96.
cremeus	815, 34, 3629/54, 12896/a, and 14275/54		Gauze *et al.*, 1957, *op. cit.*, pp. 92 and 93.
flavidovirens	827/54, 1145/53, 12287, and 12690		Gauze *et al.*, 1957, *op. cit.*, pp. 90 and 92.
flavidovirens *v.* **fuscus**	678/54, 5933/54, 10557, and 13786/54		Gauze *et al.*, 1957, *op. cit.*, pp. 91 and 92.
***fungicidicus Group A**	358-A6	Fungicidin	J. Antibiotics (Japan), **7A,** 98, 1954.
niveus		Novobiocin (cathomycin, streptonivicin, cardelmycin, crystallinic acid, antibiotic PA 93)	Antibiotics Ann., **1955/56,** p. 634; Antibiotics & Chemotherapy, **5,** 670, 1955; **6,** 135, 1956.
spheroides		Novobiocin (cathomycin, streptonivicin, cardelmycin, crystallinic acid, antibiotic PA 93)	Antibiotics Ann., **1955/56,** p. 909; Antibiotics & Chemotherapy, **5,** 670, 1955.
		YELLOW SERIES	
longisporus flavus			Krassilnikov, 1941, *op. cit.*, p. 30; 1949, *op. cit.*, p. 72.
virgatus			Krassilnikov, 1941, *op. cit.*, p. 31; 1949, *op. cit.*, p. 74.
		BLUE SERIES	
bicolor			Gauze *et al.*, 1957, *op. cit.*, pp. 123 and 127.
***chartreusis**	NRRL 2287	Chartreusin	Antibiotics & Chemotherapy, **6,** 294, 1956.

SECTION

SPIRA (S)—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		BLUE SERIES—*Continued*	
coeruleofuscus	848/53, 4205/54, 8837/54, 6520/54, 11445/54		Gauze *et al.*, 1957, *op. cit.*, pp. 123 and 128.
coeruleorubidus	9023/54, 9234, 10652, 12531/54, 13838/54, 14207, and 14741/54		Gauze *et al.*, 1957, *op. cit.*, pp. 123 and 125.
coerulescens	4562, 5992/54, 7018, 7648, 7763, 8806/54, and 9496/54	coerulomycin	Gauze *et al.*, 1957, *op. cit.*, pp. 113 and 120; Gauze to Authors, 1957 (per. comm.)
coerulescens *v.* **longisporus**			Gauze *et al.*, 1957, *op. cit.*, pp. 113 and 121.
glaucescens	1701/54, 2659, 3737, 4703, 7248/54, 8731, 12615/54, 13380, and 14335		Gauze *et al.*, 1957, *op. cit.*, pp. 122 and 123.
glaucescens *v.* **badius**			Gauze *et al.*, 1957, *op. cit.*, pp. 123 and 124.
ipomoea	35, 105, or 160	Plant pathogen	Phytopathology, **30,** 913, 1940.
viridans	111, 225, and 272		Krassilnikov, 1941, *op. cit.*, pp. 33 and 61; 1949, *op. cit.*, p. 76.
******viridochromogenes*	CBS Millard (NRRL B-1511)		Authors' data, 1955.
viridochromogenes	6A36	Chartreusin-like antibiotic	J. Antibiotics (Japan), **8A,** 96, 1955.
virido-diastaticus	329, 340, 361, 364, and 444		Giorn. microbiol., **1,** 127, 1955.
viriodosporus	PD 04889	Sistomycosin	Brit. Pat. 712,547, July 28, 1954.
		RED SERIES	
******albus*	NRRL 2490	Antibiotic 1-81d-1s	U. S. Pat. 2,805,185, Sept. 3, 1957.
arenae		Unidentified antibiotic	Brit. Pat. 719,230, Dec. 1, 1954.
aurantiogriseus			Gauze *et al.*, 1957, *op. cit.*, pp. 68 and 74.
aurini			Gauze *et al.*, 1957, *op. cit.*, pp. 53 and 54.
chromogenus		Antibiotic IA887 (netropsin-like)	J. Antibiotics (Japan), **8A,** 19, 1955.
******coelicolor*	A-134	Coelicolorin (coelicolofuin?)	J. Antibiotics (Japan), **2,** 274, 1948/49; **2,** 336, 1948/49.
daghestanicus	1109/55, 2656/55, 2794/55, 6613/54, 12676/54, 13728/54, 13897/54, and 14281/54		Gauze *et al.*, 1957, *op. cit.*, p. 59.
diastaticus	40, 74, 242, 276, 452, and 519		Giorn. microbiol., **1,** 127, 1955.
***diastaticus** *v.* **ardesiacus**	755		*Ibid.*
fradiae	117, 250, 251, 260, and B-2	Streptothricin B or BII (neomycin B) + streptothricin BI (neomycin C)	J. Antibiotics (Japan), **3,** 232, 1949/50; **3,** 582, 1949/50; **4,** 607, 1951; **5,** 343, 1952.
fumanus			Gauze *et al.*, 1957, *op. cit.*, pp. 59 and 61.
***fungicidicus Group G**	560–A2 and U-10A	Fungicidin	J. Antibiotics (Japan), **7A,** 98, 1954.
gobitricini	5618, 5647, 6143, 6178, 6583, 6595, 6956, 7902, and 9958		Gauze *et al.*, 1957, *op. cit.*, pp. 32 and 34.
griseoviridus	A 9071 (PD 04955)	Griseoviridin + viridogrisein (etamycin)	Antibiotics Ann., 1954/55, p. 790; Antibiotics & Chemotherapy, **6,** 100, 1956.
lateritius			Gauze *et al.*, 1957, *op. cit.*, pp. 68 and 70.
lavendulae			Soil Sci., **1,** 99, 1916.
lavendulae	3330, 3530, 3531, and 3532		J. Bacteriol., **62,** 149, 1951.
lavendulae		Etamycin (viridogrisein)	Antibiotics Ann., **1954/55,** p. 728.
lavendulae	2A-458	Grasseriomycin	J. Antibiotics (Japan), **8A,** 91, 1955.
******lavendulae*	A-10	Lavendulin	J. Bacteriol., **53,** 695, 1947.
lavendulae	266	Streptomycin-like antibiotic	J. Antibiotics (Japan), **2,** 341, 1948/49.
lavendulae	68, 42-B, 201, A-6, B-3, B-10, B-18, E-2, and K-4	Streptothricin, group A	J. Antibiotics (Japan), **3,** 582, 1949/50.
lavendulae	S-20	Unidentified antibiotic	J. Antibiotics (Japan), **2,** 34, 1948/49.
******phaeochromogenus*	108-A1	Moldin	J. Antibiotics (Japan), **5,** 465, 1952.
purpurascens	Stämm 346, Maria 515, Lüd 207, Pürk 271, Ist 299, Tüb 608, and others	Rhodomycins A and B	Arch. Mikrobiol., **17,** 361, 1952; **25,** 325, 1957; Brit. Pat. 708,749, May 12, 1954.

SECTION

SPIRA (S)—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		RED SERIES—*Continued*	
ramnaii		Ramnacin	Nature, **176,** 646, 1955; Ann. Biochem. and Exp. Med. (Calcutta), **15,** 175, 1955.
reticulus-ruber	17	Streptomycin-like antibiotic	J. Antibiotics (Japan), **2,** 341, 1948/49.
roseocitreus	212	Roseocitrins A and B	J. Antibiotics (Japan), **6A,** 143; 1953; **6B,** 205, 1953.
roseolilacinus	1032/54, 13613, 14014, 14212, 14213, 14250, 14260, 14369, and 14402		Gauze *et al.*, 1957, *op. cit.*, pp. 32 and 35.
roseoviolaceus	529/54, 1020/54, 1461/54, 3447/54, 8332/54, 8334/54, and 10194/54		Gauze *et al.*, 1957, *op. cit.*, p. 67.
******roseus*	R-30	Sulfactin	J. Biol. Chem., **168,** 765, 1947.
rubrocyano-diastaticus *v.* atrodiastaticus	377		Giorn. microbiol., **1,** 127, 1955.
sahachiroi	K-534	Carzinophilin	J. Antibiotics (Japan), **7A,** 107, 1954.
thermofuscus	4, 6, 8, 9, 10, 11, 13, 16, 17, and 21	Thermophile	Soil Sci., **47,** 37, 1939.
toxytricini			Gauze *et al.*, 1957, *op. cit.*, pp. 44 and 47.
venezuelae *v.* spiralis	1971, 11686/54, 12852, 13216/54, and 13784/54		Gauze *et al.*, 1957, *op. cit.*, p. 44.
vinaceus-drappus	D-12 and D-13	Antibiotic D-13	Brit. Pat. 708,686, May 5, 1954.
violascens	872/54, 3862/54, 3956/54, and 3959/54		Gauze *et al.*, 1957, *op. cit.*, pp. 32 and 41.
sp.	991-A2	Actinomycin + eurocidin-like antibiotic	J. Antibiotics (Japan), **9A,** 125, 1956.
******sp.*	A-330	Actinomycin A	J. Antibiotics (Japan), **3,** 363, 1949/50.
sp.	Ital 1130 and Ital 1131	Actinomycin X complex	Arch. Mikrobiol., **25,** 90, 1956.
		GRAY SERIES	
abikoensis	927-S1	Actinoleukin + trichomycin-ascosin-candicidin type antibiotic	J. Antibiotics (Japan), **9A,** 86, 1956.
acidophilus	1, 2, 3, and 4		Soil Sci., **25,** 225, 1928.
acrimycini *v.* globosus			Gauze *et al.*, 1957, *op. cit.*, pp. 140 and 141.
***albogriseolus**	NRRL B-1305	Neomycin complex	Antibiotics & Chemotherapy, **4,** 653, 1954.
antibioticus	3681	Actinomycin	Antibiotics & Chemotherapy, **4,** 1050, 1954.
***arabicus**	6762	Croceomycin	J. Antibiotics (Japan), **9B,** 62, 1956.
aromaticus	102, 112, 118, and 238		Krassilnikov, 1941, *op. cit.*, p. 40; 1949, *op. cit.*, p. 85.
atroolivaceus	1580/53, 2608/54, and 4776/54		Gauze *et al.*, 1957, *op. cit.*, pp. 140 and 143.
aureus			Soil Sci., **1,** 99, 1916.
aureus	364	Antiphlei 364 antibiotic	J. Antibiotics (Japan), **3,** 517, 1949/50; **4,** 185, 1951; Tôhoku J. Exp. Med., **55,** 355, 1952.
bovis *v.* nigerianus	NCTC 4572		Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
cacaoi	I(203C)	Plant pathogen	Ann. Appl. Biol., **19,** 515, 1932.
cacaoi	K-67 and C-62	Cacaomycetin	J. Antibiotics (Japan), **4,** 357, 1951; **5,** 24, 1952.
cacaoi	81	Cerevioccidin	J. Antibiotics (Japan), **8A,** 42, 1955.
californicus			Soil Sci., **1,** 99, 1916.
chromofuscus			Gauze *et al.*, 1957, *op. cit.*, pp. 170 and 176.
collinus	Ist 301	Collinomycin + rubromycin	Arch. Mikrobiol., **17,** 361, 1952; **18,** 327, 1953; Naturwiss., **40,** 59, 1953; **40,** 166, 1953.
cyaneus			Krassilnikov, 1941, *op. cit.*, p. 14; 1949, *op. cit.*, p. 53.

SECTION

SPIRA (S)—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		GRAY SERIES—*Continued*	
***eadus**	9-20	Endomycin	Phytopathology, **41,** 393, 1951; Brit. Pat. 705,622, Mar. 17, 1954; U. S. Pat. 2,746,902, May 22, 1956.
***filipinensis**	114-8	Filipin	Phytopathology, **45,** 559, 1955.
fimbriatus	23	Plant pathogen	Ann. Appl. Biol., **13,** 580, 1926.
flaveolus	P-4	Actinomycin A	J. Antibiotics (Japan), **4,** 335, 1951.
flaveolus	W-36	Flaveolin	J. Antibiotics (Japan), **6A,** 11, 1953.
†**flavovirens**	128		Soil Sci., **8,** 71, 1919.
flavoviridis			Krassilnikov, 1941, *op. cit.*, p. 30; 1949, *op. cit.*, p. 72.
flavus	134	Actinoflavin (actinomycin A)	J. Penicillin (Japan), **1,** 129, 1947; J. Antibiotics (Japan), **4,** 335, 1951.
ganmycicus		Ganmycin + carcinomycin	J. Antibiotics (Japan), **9A,** 8, 1956; **9A,** 113, 1956; **9B,** 160, 1956.
†**gelaticus**	104		Soil Sci., **8,** 71, 1919.
graminofaciens		Streptogramin	Antibiotics Ann., **1953/54,** p. 171; Antibiotics & Chemotherapy, **3,** 1283, 1953.
griseochromogenes	2A 327	Blasticidins A, B, and C	Bull. Agr. Chem. Soc. Japan, **19,** 181, 1955.
griseoincarnatus			Gauze *et al.*, 1957, *op. cit.*, pp. 169 and 170.
**griseolus*	14576-4 (ATCC 11796)	Anisomycin	J. Am. Chem. Soc., **76,** 4053, 1954; Antibiotics Ann., **1954/55,** p. 809; U. S. Pat. 2,691,618, Oct. 12, 1954.
griseomycini			Gauze *et al.*, 1957, *op. cit.*, pp. 132 and 136.
griseoruber			Gauze *et al.*, 1957, *op. cit.*, pp. 186 and 195.
griseorubiginosus *v.* **spiralis**			Gauze *et al.*, 1957, *op. cit.*, pp. 186 and 194.
griseus			Gauze *et al.*, 1957, *op. cit.*, pp. 131 and 132.
griseus variabilis			Krassilnikov, 1949, *op. cit.*, p. 95.
griseus zonatus			*Ibid.*
halstedii			Soil Sci., **1,** 99, 1916.
hawaiiensis		Bryamycin (thiostrepton)	Antibiotics & Chemotherapy, **6,** 63, 1956.
hygroscopicus			Proc. Linnean Soc. N.S. Wales, **56,** 345, 1931.
hygroscopicus *v.* **angustmyceticus**	6A-704	Angustmycins A, B (adenine), and C	J. Antibiotics (Japan), **7A,** 113, 1954; **7A,** 116, 1954; **9A,** 195, 1956.
**hygroscopicus*	1545	Hygroscopins A, B, and C	J. Agr. Chem. Soc. Japan, **28,** 296, 1954; **28,** 715, 1954; J. Antibiotics (Japan), **7B,** 329, 1954.
iverini	1534/53, 3084, 12735, 13008, 13009, and 13062		Gauze *et al.*, 1957, *op. cit.*, pp. 132, and 138.
kurssanovii	177/54, 405/53, 760/53, 7069a/54, 7235/54, 9238, 10294, 10570, 10579, 10583, 10656, 10665, 10762, 10991, 11074, and 12502/54		Gauze *et al.*, 1957, *op. cit.*, pp. 151 and 156.
longisporus griseus			Krassilnikov, 1949, *op. cit.*, p. 98.
lydicus		Streptolydigin	Antibiotics Ann., **1955/56,** p. 886.
malachitus			Gauze *et al.*, 1957, *op. cit.*, pp. 162 and 164.
marinus		Agar-digestion	Bull. Duke Univ. Marine Sta., No. 3: 76, 1946.
mitakaensis	74-4	Mikamycin	J. Antibiotics (Japan), **9A,** 193, 1956.
mutabilis	1176/53, 9039, 12110, 12415/56, 12421/54, 12679a, and B-472		Gauze *et al.*, 1957, *op. cit.*, pp. 164 and 166.

SECTION
SPIRA (S)—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		GRAY SERIES—*Continued*	
***naganishii**	H-4869 and H-4871	Anti-*Trichomonas* antibiotic	J.Gen. Appl. Microbiol. (Japan), **1,** 201, 1955.
***narbonensis**	ETH 7346	Narbomycin	Helv. Chim. Acta, **38,** 935, 1955.
nigrescens	1800/54, 1555/53, 6618/54, 7083/54, 8511/54, 9177/54, and 10638/54		Gauze *et al.*, 1957, *op. cit.*, pp. 140 and 146.
†**olivochromogenus**	Chromogenus 205		Soil Sci., **8,** 71, 1919.
***parvullus**	3677	Actinomycin D	Antibiotics Ann., **1954/55,** p. 853; Antibiotics & Chemotherapy, **4,** 1050, 1954.
parvus	3679	Actinomycin	Antibiotics & Chemotherapy, **4,** 1050, 1954.
***platensis**	NRRL 2364	Oxytetracycline	Brit. Pat. 713,795, Aug. 18, 1954.
pseudogriseolus	534	Xanthomycin	J. Antibiotics (Japan), **8A,** 126, 1955.
purpeochromogenus	108	Eumycetin + violacetin	J. Antibiotics (Japan), **7A,** 165, 1954; **8A,** 33, 1955; **8B,** 118, 1955.
rubiginosus			Gauze *et al.*, 1957, *op. cit.*, pp. 132 and 134.
***rubrocyano-diastaticus** *v.* **impiger**	565 and 640		Giorn. microbiol., **1,** 127, 1955.
rutgersensis			Soil Sci., **1,** 99, 1916.
rutgersensis	H-1159	Xanthomycin-like antibiotic	J. Antibiotics (Japan), **4,** 467, 1951.
***rutgersensis** *v.* **castelarense**	DINR-41	Camphomycin	Rev. invest. agr. (Buenos Aires), **8,** 263, 1954.
scabies		Plant pathogen	Conn. Agr. Exp. Sta. Ann. Rept., 1891, p. 153.
spiralis	11		Ann. Appl. Biol., **13,** 580, 1926.
variabilis			Gauze *et al.*, 1957, *op. cit.*, pp. 170 and 171.
variabilis *v.* **roseolus**			Gauze *et al.*, 1957, *op. cit.*, pp. 170 and 172.
****violaceoniger**	NRRL B-1476, NRRL B-1477, and NRRL B-1478	Nigericin?	Appl. Microbiol., **3,** 1, 1955; Authors' data, 1956.
violaceus			Soil Sci., **1,** 99, 1916.
violaceus chromogenes		Plant pathogen	Krassilnikov, 1949, *op. cit.*, p. 55.
viridiviolaceus			Gauze *et al.*, 1957, *op. cit.*, pp. 186 and 188.
willmorei	NCTC 1856	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
sp.	A9-6	Actinomycin	Can. J. Research, **26C,** 27, 1948.
sp.	Ag 2023, Ag 2025, Ag 2026, Ag 2027, Ag 2028, Din 452, and Wind 756	Actinomycin X complex	Arch. Mikrobiol., **25,** 90, 1956.
****sp.**	M 4575	Amphotericins A and B	Antibiotics Ann., **1955/56,** pp. 579 and 587.
****sp.**	C-6	Chromin	J. Antibiotics (Japan), **4,** 357, 1951; **5,** 577, 1952; **5,** 677, 1952.
sp.	ETH 8703 and ETH 9427	Foromacidins A, B, C, and D	Helv. Chim. Acta, **39,** 304, 1956.
****sp.**	91-6	Fuscomycin (xanthomycin?)	J. Antibiotics (Japan), **5,** 481, 1952.
****sp.**	AAK-84	Gancidin	J. Antibiotics (Japan), **9A,** 97, 1956; **9B,** 160, 1956.
sp.	A158	Helixins A, B, C, and D	Mycologia **44,** 159, 1952; Phytopathology, **42,** 506, 1952.
****sp.**	65-24	Levomycin	Arch. Biochem. Biophys., **53,** 282, 1954.
****sp.**	Nig-1	Nigericin	Proc. Indiana Acad. Sci., **59,** 38, 1950; Antibiotics & Chemotherapy, **1,** 594, 1951.
sp.		Streptomycin + streptothricin-like antibiotic	J. Bacteriol., **53,** 769, 1947.
****sp.**	94	Xanthomycins A and B	J. Biol. Chem., **176,** 413, 1948.
sp.	T. 3414	Unidentified antibiotic	Ann. pharm. franç., **12,** 440, 1954.
****sp.**	MD-2428	Steroid conversion	J. Am. Chem. Soc., **74,** 2126, 1952.

SECTION

SPIRA (S)—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		SERIES UNKNOWN	
odoratus	350 and 423		Krassilnikov, 1941, *op. cit.*, p. 40; 1949, *op. cit.*, p. 86.
phoenix		Rhodocidin	Antibiotics & Chemotherapy, **3**, 788, 1953.
sp.	A-1404	Dextromycin (neomycin) + fradicin-mycelin type antibiotic	J. Antibiotics (Japan), **3**, 297, 1949/50; **3**, 440, 1949/50; **8B**, 360, 1955; **9B**, 113, 1956.

SECTION

MONOVERTICILLUS *sect. nov.*

Streptomycetes with sporophores as primary verticils or whorls attached to long, straight branches; no spirals.

Section epithet derived from the Greek "*μόνος*" meaning "one" and the Latin "vertex" meaning "a whirl."

We have not yet observed a culture which could be placed with certainty in this section. Generally, those cultures reported to be monoverticillate are, in fact, biverticillate.

SECTION

MONOVERTICILLUS (MV)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		WHITE SERIES	
mediocidicus	535-A1 and 676-C1	Mediocidin	J. Antibiotics (Japan), **7A**, 98, 1954.
		OLIVE-BUFF SERIES	
		YELLOW SERIES	
viridoflavus		Candidin complex	*Actinomycetes and their antibiotics*, Williams and Wilkins, Baltimore, 1953, p. 66; Antibiotics & Chemotherapy, **4**, 455, 1954.
		BLUE SERIES	
		RED SERIES	
		GRAY SERIES	
sp.	C-20	Unidentified antifungal antibiotic	J. Antibiotics (Japan), **4**, 357, 1952.
		SERIES UNKNOWN	

SECTION

MONOVERTICILLUS-SPIRA *sect. nov.*

Streptomycetes with sporophores as primary verticils or whorls attached to long, straight branches; elements of verticils or whorls spiralled.

Section epithet derived from the Greek "*μόνος*" meaning "one," the Latin "vertex" meaning "a whirl," and from the Latin "spira" meaning "a coil or twist."

We have not yet observed a culture which could be placed with certainty in this section. Those cultures reported to be monoverticillate with spirals possibly are biverticillate with elements of the secondary verticils or whorls spiralled.

SECTION

MONOVERTICILLUS-SPIRA (MV-S)

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		WHITE SERIES	
circulatus			Krassilnikov, 1941, *op. cit.*, p. 60; 1949, *op. cit.*, p. 112.
		OLIVE-BUFF SERIES	
		YELLOW SERIES	
		BLUE SERIES	
		RED SERIES	
netropsis	7618	Sinanomycin (netropsin)	J. Antibiotics (Japan), **9A,** 102, 1956.
		GRAY SERIES	
		SERIES UNKNOWN	

SECTION

BIVERTICILLUS *sect. nov.*

Streptomycetes cum sporophora opposita ramosa et multipliciter verticillata; spirae nullae. Tyfus Streptomyces cinnamomeus Benedict et al. NRRL B-1285 in Culture Collection Northern Utilization Research and Development Division depositus.

Streptomycetes with sporophores as compound verticils or whorls attached to long, straight branches; no spirals, Type: *Streptomyces cinnamomeus* Benedict *et al.*, strain NRRL B-1285.

Section epithet derived from the Latin "bis" meaning "two" and "vertex" meaning "a whirl."

SECTION

BIVERTICILLUS (BIV)

Epithet	Strain Number	Metabolic product(s) or Activity	Reference
		WHITE SERIES	
mashuensis		Streptomycin + antifungal antibiotic	J. Antibiotics (Japan), **8A,** 44, 1955.
		OLIVE BUFF SERIES	
***albireticuli**	3724	Eurocidin + enteromycin + carbomycin	J. Agr. Chem. Soc. Japan, **29,** 647, 1955.
caespitosus	V621	Mitomycins A and B	J. Antibiotics (Japan), **9A,** 141, 1956; **9A,** 147, 1956.
***eurocidicus**	549-A1	Eurocidin + azomycin + tertiomycins A and B	J. Antibiotics (Japan), **7A,** 98, 1954; **8A,** 105, 1955; **8A,** 161, 1955; **9B,** 200, 1956.
olivoverticillatus	383		Mem. Osaka Univ. Lib. Arts & Ed., No. 5B: 84, 1956.
		YELLOW SERIES	
kitasatoensis	299-5 and S-7	Leucomycin and leucomycin B + unnamed antibiotic	J. Antibiotics (Japan), **6A,** 87, 1953; **6A,** 109, 1953; **9A,** 202, 1956.
luteoverticillatus	486		Mem. Osaka Univ. Lib. Arts & Ed., No. 5B: 84, 1956.
		BLUE SERIES	
verticillatus viridans			Krassilnikov, 1941, *op. cit.*, p. 59; 1949, *op. cit.*, p. 110.
		RED SERIES	
***albus** **biverticillatus**	NRRL 2401	Acetopyrrothine (thiolutin)	U. S. Pat. 2,689,854, Sept. 21, 1954. Gauze *et al.*, 1957, *op. cit.*, pp. 68 and 75.
***cinnamomeus** *f.* **cinnamomeus**	NRRL B-1285	Cinnamycin + unnamed antibiotic	Antibiotics & Chemotherapy, **2,** 591, 1952; **4,** 1135, 1954; Phytopathology, **46,** 575, 1956.
***cinnamomeus** *f.* **azacoluta**	NRRL B-1699	Antibiotic F-17 mixture (duramycin + antibiotics A and C)	Phytopathology, **46,** 568, 1956; **46,** 575, 1956; Abstr. of Papers, 131st Meeting Am. Chem. Soc., p. 18-0, 1957.

SECTION
BIVERTICILLUS (BIV)—*Continued*

Epithet	Strain Number	Metabolic product(s) or Activity	Reference
		RED SERIES (*Continued*)	
***griseocarneus**	NRRL B-1068 and NA232-M1	Hydroxystreptomycin + antifungal antibiotic	Science, **112,** 77, 1950; Arch. Biochem., **28,** 150, 1950; Antibiotics & Chemotherapy, **1,** 309, 1951; Bacteriol. Proc. Soc. Am. Bacteriologists, p. 30, 1951; J. Bacteriol., **62,** 487, 1951; U. S. Pat. 2,617,755, Nov. 2, 1952.
hachijoensis	H-2609	Trichomycins A, B, and C	J. Antibiotics (Japan), **7A,** 10, 1954; **8A,** 48, 1955.
***hiroshimensis**	201		Seibutagakkaishi, **6,** 43, 1955.
***kentuckensis**	5X1 RCV (ATCC 12691)	Raisnomycins	Antibiotics & Chemotherapy, **6,** 286, 1956.
lilacinus	2305	Cladomycin	J. Antibiotics (Japan), **9B,** 81, 1956.
***netropsis**	2937-6	Netropsin	J. Am. Chem. Soc., **73,** 341, 1951; U.S. Pat. 2,586,762, Feb. 19, 1952.
**reticuli*	H-365	Reticulin (hydroxystreptomycin) + rotaventin	J. Antibiotics (Japan), **3,** Suppl. A: 66, 1949/50; **5,** 451, 1952; **6B,** 61, 1953.
roseoverticillatus	462		Mem. Osaka Univ. Lib. Arts & Ed., No. 5B: 84, 1956.
**rubrireticuli*	3631		Author's data, 1956.
***salmonicida**		Fish pathogen	J. Bacteriol., **58,** 659, 1954.
sp.	H-3030	Trichomycin	J. Antibiotics (Japan), **7A,** 10, 1954.
		GRAY SERIES	
**abikoensis*	3654		Author's data, 1956.
		SERIES UNKNOWN	
ehimensis	138	Candimycin	J. Antibiotics (Japan), **7B,** 168, 1954.
multifidus			Krassilnikov, 1941, *op. cit.*, p. 59.
reticuli	3724		J. Agr. Chem. Soc. Japan, **29,** 644, 1956.
reticulus-ruber	F-20	Unidentified antibiotic	J. Antibiotics (Japan), **5,** 67, 1952.
verticillatus			Mikrobiologiya, **7,** 105, 1938.
sp.	III	Thermophile	Soil Sci., **47,** 37, 1939.

SECTION
BIVERTICILLUS-SPIRA *sect. nov.*

Streptomycetes with sporophores as compound verticils or whorls attached to long, straight branches; elements of secondary verticils or whorls spiralled.

Section epithet derived from the Latin "bis" meaning "two," "vertex" meaning "a whirl," and "spira" meaning "a coil or twist."

We have not yet observed a culture which could be placed with certainty in this section, although *S. netropsis* 2937-6 possibly may be placed in the red series.

SECTION
BIVERTICILLUS-SPIRA (BIV-S)

Epithet	Strain Number	Metabolic product(s) or Activity	Reference
		WHITE SERIES	
		OLIVE-BUFF SERIES	
		YELLOW SERIES	
		BLUE SERIES	
		RED SERIES	
reticulus-ruber			Soil Sci., **8,** 71, 1919.
		GRAY SERIES	
		SERIES UNKNOWN	

SPECIES AND STRAINS FOR WHICH SECTION POSITION IS UNKNOWN

The nomenclature and taxonomic position of species and strains which fall in this group require critical examination. Many are not sufficiently described or illustrated to warrant their being placed in any of the preceding sections. Undoubtedly, some could be placed in their proper category with a minimum of laboratory study. Some of these are species for which the types have degenerated or are no longer available. Many are so broadly defined that they could be referred to a number of presently recognized species.

SECTION POSITION UNKNOWN

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		WHITE SERIES	
albidus			Duché, J., 1934, Les *Actinomyces* du Groupe, *Albus*, Vol. 6, Encyclopédie Mycologique, edited by Paul Lechevalier & Sons, Paris, France, p. 266.
almquisti			Duché, 1934, *op. cit.*, p. 278.
chrysomallus	192, 326, 327, and Wal. 679	Actinomycins C_1, C_2, and C_3	Arch. Mikrobiol., **18,** 327, 1953.
coelicolor			Centr. Bakteriol. Parasitenk., I Abt., **46,** 195, 1908.
exfoliatus			Soil Sci., **1;** 99, 1916.
fimicarius			Duché, 1934, *op. cit.*, p. 346.
flocculus			Duché, 1934, *op. cit.*, p. 300.
gougeroti			Duché, 1934, *op. cit.*, p. 272.
griseolus		Griseomycin (lomycin)	Antibiotics & Chemotherapy, **3,** 1243, 1953.
heimi			Duché, 1934, *op. cit.*, p. 359.
luteochromogenus	146-A2	Phthiomycin	J. Antibiotics (Japan), **6A,** 183, 1953.
malenconi			Duché, 1934, *op. cit.*, p. 353.
marinolimosus	513		Bull. Scripps Inst. Oceanogr. Univ. Calif., **5,** 239, 1944.
mirabilis		Miramycin	Pharmazie, **7,** 542, 1952.
pheochromogenus			N. Y. State Agr. Exp. Sta., Geneva, N. Y., Tech. Bull., **60,** 1, 1917.
thioluteus	26A and 4-A1	Aureothricin + aureothin	Japan. Med. J., **1,** 512, 1948; J. Antibiotics (Japan), **2,** Suppl. **A:** 105, 1948/49; **6A:** 137, 1953.
sp.	H-1205	Unidentified basic antibiotic	J. Antibiotics (Japan), **5,** 245, 1952.
		OLIVE-BUFF SERIES	
*** autotrophicus**		(Resembles *Nocardia coeliaca*)	Arch. Mikrobiol., **25,** 58, 1956.
blastmyceticus	455 D1	Blastmycin + polyene antibiotic	J. Antibiotics (Japan), **10A,** 39, 1957.
griseoflavus	206	Grisamine	J. Antibiotics (Japan), **8A,** 39, 1955.
griseus			Krainsky, A., Die Aktinomyceten und ihre Bedeutung in der Natur., Centr. Bakteriol., Parasitenk., II Abt., **41,** 649, 1914.
*** nitrificans**		(Resembles *Nocardia coeliaca*)	Bacteriol. Proc. Soc. Am. Bacteriologists, p. 152, 1952; J. Bacteriol., **68,** 1, 1954.
		YELLOW SERIES	
albosporeus			Krainsky, 1914, *op. cit.*
alboviridis			Duché, 1934, *op. cit.*, p. 317.
citreus			Krainsky, 1914, *op. cit.*
krainskii			Duché, 1934, *op. cit.*, p. 306.
lieskei			Duché, 1934, *op. cit.*, p. 289.
parvus			Krainsky, 1914, *op. cit.*
phaeochromogenus	A-1502α	Chloramphenicol	J. Antibiotics (Japan), **3,** 297, 1949/50; **3,** 512, 1949/50.
sp.	116, 330, and 331	Actinomycin C	Arch. Mikrobiol., **18,** 327, 1953.
		BLUE SERIES	
baarnensis	*A. viridis* of Duché		Duché, 1934, *op. cit.*, p. 311; Personal Communication. Duché to Pridham, 1957.
griseoflavus			Krainsky, 1914, *op. cit.*
viridis	747	Chartreusin-like glucosidic antibiotic	Antibiotics & Chemotherapy, **6,** 283, 1956.
viridochromogenes			Krainsky, 1914, *op. cit.*
		RED SERIES	
alboatrus			Soil Sci., **1,** 99, 1916.
lavendulae		Framycetin	Ann. pharm. franç., **11,** 44, 1953.
microflavus			Krainsky, 1914, *op. cit.*

SECTION POSITION UNKNOWN—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		RED SERIES—*Continued*	
rectus bruneus			Krassilnikov, 1949, *op. cit.*, p. 65.
roseochromogenus	K-300 and 318	Orientomycin (special substance No. 2, K-300 substance, D-4-amino-3-isoxazolidone, cycloserine, oxamycin, antibiotic PA 94)	J. Antibiotics (Japan); **4,** 183, 1951; **5,** 481, 1952; **5,** 682, 1952; **7B,** 81, 1954; **9A,** 164, 1956.
roseochromogenus	Seki and 259	Streptothricin 2	J. Antibiotics (Japan), **4,** 183, 1951.
roseochromogenus	39	Streptothricin 1 (roseomycin)	*Ibid.*
roseodiastaticus			Duché, 1934, *op. cit.*, p. 329.
roseus			Krainsky, 1914, *op. cit.*
ruber			*Ibid.*
sp.		Mycolutein + pulvomycin	Antibiotics & Chemotherapy, **5,** 652, 1955; **7,** 384, 1957.
sp.	T. 4473	Unidentified antibiotic	Ann. pharm. franç., **12,** 440, 1954.
		GRAY SERIES	
albus	2265	Isomaltose-like antibiotic	J. Antibiotics (Japan), **7B,** 51, 1954.
cellulosae			Krainsky, 1914, *op. cit.*
cinereoruber	ETH 7451 and others	Rhodomycin	Arch. Mikrobiol., **25,** 325, 1957.
coelicolor *v.* **achrous**	504/54, 651/55, 4909/54, 10594, and SAW 3355		Gauze *et al.*, 1957, *op. cit.*, p. 191.
coelicolor *v.* **flavus**	38/55, 5636/54, and 10147		Gauze *et al.*, 1957, *op. cit.*, p. 192.
diastaticus			Krainsky, 1914, *op. cit.*
diastaticus *v.* **lipmanii**			Giorn. microbiol., **1,** 127, 1955.
diastatochromogenes			Krainsky, 1914, *op. cit.*
erythrochromogenes			*Ibid.*
flavochromogenes			*Ibid.*
flavogriseus			Duché, 1934, *op. cit.*, p. 341.
flavovirens	83D	Actinomycin	J. Bacteriol., **56,** 107, 1948.
flavus			Krainsky, 1914, *op. cit.*
flavus	O-2	Streptothricin type 3 + flavacid (C-type substance) + D-type substance	J. Antibiotics (Japan), **6A,** 117, 1953.
gedanensis			Z. Hyg. Infektionskrankh., **63,** 1, 1909.
hygroscopicus		Antibiotic M-4209 (carbomycin)	Antibiotics & Chemotherapy, **3,** 899, 910, 1953.
echinatus	ETH 8331	Echinomycin	Helv. Chim. Acta, **40,** 199, 1957.
limosus	BöBr 136 and Per. 176		Arch. Mikrobiol., **17,** 361, 1952.
melanocyclus			Krainsky, 1914, *op. cit.*
melanosporeus			*Ibid.*
noursei	5286	Phalamycin	Antibiotics & Chemotherapy, **3;** 818, 1953.
olivaceus	346	Streptomycin	J. Antibiotics (Japan), **4;** 183, 1951.
parvus	3680	Actinomycin	Antibiotics & Chemotherapy, **4;** 1050, 1954.
pheochromogenus	406	New antibiotic No. 1	J. Antibiotics (Japan), **4,** 183, 1951.
phaeochromogenus *v.* **chloromyceticus**	B-870	Thiomycin	J. Antibiotics (Japan), **8A,** 118, 1955.
poolensis	304	Streptomycin-like antibiotic	J. Antibiotics (Japan), **4,** 183, 1951.
tanashiensis	N-109	Luteomycin-like antibiotic + acidic antibiotic	J. Antibiotics (Japan), **6A,** 172, 1953.
xanthophaeus	Wüst 70	Unnamed antibiotic	Arch. Mikrobiol., **17,** 361, 1952.
sp.	le, Badberg, 847, and Pü. 262 (abb. 1)	Actinomycin	Arch. Mikrobiol., **18,** 327, 1953.
sp.	Wind. 731	Actinomycin X	*Ibid.*
sp.	A-1129 and A-1165	Aklavin	J. Bacteriol., **72,** 90, 1956.
sp.	304	Cremomycin	J. Antibiotics (Japan), **4,** 183, 1951; **5,** 615, 1952.
sp.		Fungichromatin	Antibiotics Ann., **1954/55,** p. 716.
sp.		Geomycin	Angew. Chemie, **66;** 1, 1954.
sp.		Kanamycin	J. Antibiotics (Japan), **10A,** 107, 1957.

SECTION POSITION UNKNOWN—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		GRAY SERIES—*Continued*	
sp.	A 717	Nybomycin	Antibiotics & Chemotherapy, **4;** 380 1954; Proc. Nat. Acad. Sci. U. S. **41,** 620, 1955.
sp.	6706	Pyridomycin	J. Antibiotics (Japan), **7A,** 58, 1954.
sp.		Thiostrepton (bryamycin)	Antibiotics Ann., **1955/56,** p. 554.
sp.	30-10	Antibiotic 30-10	Ber. O'Hara Inst., **10;** 229, 1956.
sp.		Antibiotic 1943	Antibiotics & Chemotherapy, **7,** 345, 1957.
sp.	105	Unidentified lytic agent	Compt. rend., **226,** 1146, 1948.
		SERIES UNKNOWN	
abikoensum	489-C2	Ascosin + abikoviromycin	J. Antibiotics (Japan), **7A,** 98, 1954.
achromogenes	Z-4-1	Achromoviromycin + sarcidin	J. Antibiotics (Japan), **6A,** 38, 1953.
albidoflavus		Streptothricin A	*Ibid.*
albidoflavus		Vitamin B_{12}	U. S. Pat. 2,595,499, May 6, 1952.
albus	56, 82, and others	Mucinase	Rev. Belge Path. Med. exp., **23,** 370, 1954; Zentr. Bakteriol., Parasitenk., I. Abt., **165,** 122, 1956.
albus		Xanthothricin	Antibiotics & Chemotherapy, **4,** 259, 1954.
albus sterilis			Krassilnikov, 1941, *op. cit.*, p. 52; 1949; *op. cit.*, p. 89.
ambofaciens		Miamycin + spiramycin-like complex	Antibiotics & Chemotherapy, **7,** 37, 1957.
aminophilus	Nepara 1968	Antibiotic 1968 (Nepara)	Antibiotics Ann., **1955/56,** p. 236.
antibioticus		Actinomycelin	Publ. tech. No. 16, inst. fitotech., p. 147, 1948.
antibioticus	S-4	Actinomycin A	Science, **101,** 665, 1945.
antibioticus		Actinomycin C	Naturwiss., **39,** 376, 1949.
antibioticus	C-930	Phagocidin	J. Antibiotics (Japan), **9A,** 152, 1956.
antibioticus		Antibiotic PA 105	Antibiotics Ann., **1954/55,** p. 827.
antibioticus		Vitamin B_{12}	U. S. Pat. 2,595,499, May 6, 1952.
aureofaciens	A-64A, A-64B, Sa, and Sb	Chlortetracycline + aureofacin	J. Antibiotics (Japan), **9B,** 79, 1956.
aureofaciens		Quinocycline complex (6 components including quinocyclines A and B and isoquinocyclines A and B)	Abstr. 5th Antibiotic Symposium, 1957.
aureus	L131	Unidentified antibiotic	J. Antibiotics (Japan), **2,** 271, 1948/49.
aureus	Q-11A	Actinoleukin	J. Antibiotics (Japan), **7A,** 125, 1954.
aureus	W.C. 3676	Steroid conversion	U. S. Pat. 2,753,290, July 3, 1956.
aureus or *phaeochromogenus*	PD 04997	6-Diazo-5-oxo-L-norleucine (DON)	Antibiotics & Chemotherapy, **6,** 487 1956.
bobili			Soil Sci., **1,** 99, 1916.
bobili or *lavendulae*	A-422	Unidentified antibiotic	J. Antibiotics (Japan), **3,** 203, 1949/50.
calvus	T3018	Nucleocidin	Abstr. 4th Antibiotic Symposium, 1956; Antibiotics Ann., **1956/57,** p. 716.
cellulosae		Fungichromin + actinomycin	Antibiotics Ann., **1954/55,** pp. 716 and 718.
cinereoruber *v.* **fructofermentans**	ETH 6143	Cinerubin	Arch. Mikrobiol., **25,** 325, 1957.
colombiensis		Vitamin B_{12}	U. S. Pat. 2,595,499, May 6, 1952.
colorata		Cellulose decomposition	J. Bacteriol., **12,** 1 and 343, 1926.
coremiales			Krassilnikov, 1949, *op. cit.*, p. 88.
diastatochromogenes	207	Fradicin-mycelin type antibiotic	J. Antibiotics (Japan), **9B,** 113, 1956.
exfoliatus		Exfoliatin	J. Antibiotics (Japan), **5,** 466, 1952.
gallicus	NCTC 4582		Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
gibsonii	NCTC 4575		*Ibid.*
griseolus	T 4126	Oxytetracycline	Ann. pharm. franç., **12,** 440, 1954.
griseoplanus	AA-223	Alazopeptin	Abstr. 4th Antibiotic Symposium, 1956; Antibiotics Ann., **1956/57,** p. 730.

SECTION POSITION UNKNOWN—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		SERIES UNKNOWN—*Continued*	
griseus	3496	Streptomycin + streptocin	J. Bacteriol., **59,** 523, 1950.
griseus	3533	Streptocin + cycloheximide	Proc. Soc. Exp. Biol. Med., **70,** 308, 1949; J. Bacteriol., **59,** 523, 1950.
griseus	Various strains	Vitamin B_{12}	U. S. Pat. 2,595,159, Apr. 29, 1952; U. S. Pat. 2,563,794, Aug. 7, 1951; U. S. Pat. 2,582,589, Jan. 15, 1952.
griseus	58-B	Demyelination	J. Bacteriol., **73,** 148, 1957.
halotrichis	618		Bull. Scripps Inst. Oceanogr. Univ. Calif., **5,** 239, 1944.
halstedii		Carbomycin	Antibiotics & Chemotherapy, **2,** 441, 1952.
humidus	23572	Dihydrostreptomycin	Proc. Japan Acad. Sci., **32,** 648, 1956.
hygroscopicus	M5-13184, M5-14154, and M43-03749	Hygromycin	Antibiotics & Chemotherapy, **3,** 1268, 1953; Antibiotics Ann., **1953/54,** p. 157.
kitasatoensis	170	Leucomycin	J. Antibiotics (Japan), **9B,** 213, 1956.
lavendulae		Mycobacidin	Antibiotics & Chemotherapy, **2,** 333, 1952.
lavendulae	3716	Mycothricin complex	Plant Disease Reporter, **40,** 483, 1956; Mycologia, **48,** 800, 1956.
lavendulae	WC 3440-14	Steroid conversion	J. Am. Chem. Soc., **75,** 5764, 1953; U. S. Pat. 2,756,179, July 24, 1956; Bacteriol. Proc. Soc. Am. Bacteriologists, p. 133, 1957.
lavendulae	136B	Antibiotics 136 and B	Arch. Biochem., **15,** 215, 1947.
lavendulae	156	Unidentified basic antibiotic	J. Antibiotics (Japan), **7B,** 192, 1954.
lavendulae *v.* **japonicus**	E-2	Streptothricin	J. Antibiotics (Japan), **9B,** 62, 1956.
leidynematis		Insect pathogen	Trans. Am. Microscop. Soc., **72,** 376, 1953.
maculatus	13		Ann. Appl. Biol., **13,** 580, 1926.
microflavus		Streptothricin A	J. Antibiotics (Japan), **6A,** 38, 1953.
natalensis		Pimaricin	Abstr. 5th Antibiotic Symposium, 1957.
noursei		Fungicidin + cycloheximide	Antibiotics Ann., **1955/56,** p. 245.
orchidaceus		Cycloserine (D-4-amino-3-isoxazolidone, oxamycin, orientomycin, antibiotic PA 94)	Antibiotic Med., **1,** 72, 1955; Antibiotics & Chemotherapy, **5,** 204, 1955; J. Am. Chem. Soc., **77,** 2345, 1955.
panja	NCTC 4574	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
parvus		Eulicin + actinomycin + basic antibiotic	Antibiotics Ann., **1955/56,** pp. 228 and 231.
pheochromogenus	Hosoya	Chloramphenicol	J. Antibiotics (Japan), **4,** 183, 1951.
pleofaciens		Pleomycin	Antibiotics Ann., **1954/55,** p. 806.
pluricolorescens	91-T1	Pluramycins A and B	J. Antibiotics (Japan), **9A,** 22, 1956; **9A,** 75, 1956.
puniceus		Viomycin	Am. Rev. Tuberc., **63;** 1, 1951.
purpeo-chromogenus			Soil Sci., **1,** 99, 1916.
rimosus	T 2861	Oxytetracycline	Ann. pharm. franç., **12,** 440, 1954.
roseochromogenus	B-2	Roseomycin	J. Antibiotics (Japan), **9B,** 160, 1956.
roseochromogenus	674 A-1	Seligocidin	J. Antibiotics (Japan), **7A,** 57, 1954.
roseochromogenus	24	Unidentified basic antibiotic	J. Antibiotics (Japan), **3,** 839, 1949/50.
roseochromogenus		Vitamin B_{12}	U. S. Pat. 2,595,499, May 6, 1952.
ruber		Mycoticin	J. Invest. Dermatol., **23,** 163, 1954.
rubrireticuli		Trichonin	J. Antibiotics (Japan), **8A,** 189, 1955.
rubrocyano-diastaticus			Giorn. microbiol., **1,** 127, 1955.
rutgersensis		Ruticin	Antibiotics Ann., **1953/54,** p. 174.
salmonicolor	14		Ann. Appl. Biol., **13,** 580, 1926.
scabies	6	Plant Pathogen	Ann. Appl. Biol., **14,** 296, 1927.
somaliensis			Arch. parasitol., **10,** 489, 1906; Precis de Parasitologie, Masson et Cie, Paris, France, 1913, p. 967.

SECTION POSITION UNKNOWN—*Continued*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		SERIES UNKNOWN—*Continued*	
spectabilis		Streptovaricin (8 components)	Chem. Eng. News, **35,** 30, 1957; Antibiotics & Chemotherapy, **4,** 200, 1957; Abstr. 5th Antibiotic Symposium, 1957.
sterilis ruber			Krassilnikov, 1941, *op. cit.*, p. 24; 1949, *op. cit.*, p. 58.
subtropicus		Albomycin (grisein)	Brit. Med. J., p. 1177, 1951; Science, **125,** 585, 1957; **125,** 587, 1957.
toyocaensis (*albus*)	278	Toyocamycin	J. Antibiotics (Japan), **8A,** 189, 1955; **9A,** 60, 1956.
tumuli	4	Plant pathogen	Ann. Appl. Biol., **14,** 296, 1927.
upcottii	NCTC 450	Human pathogen	Med. Research Council (Brit.), Spec. Rep. Ser. No. 203: 1, 1935.
verne			Soil Sci., **1,** 99, 1916.
virginiae		Streptogramin-like antibiotic	Antibiotics & Chemotherapy, **5,** 632, 1955.
viridis sterilis			Krassilnikov, 1941, *op. cit.*, p. 35; 1949, *op. cit.*, p. 78.
sp.	A-1129	Acidomycin (actithiazic acid)	J. Antibiotics (Japan), **6A,** 158, 1953.
sp.		Actiduins	Chem. & Ind. (London), 1955: 442.
sp.	657-A2 and 688-CZ1	Actinoleukin-like antibiotic	J. Antibiotics (Japan), **7A,** 125, 1954.
sp.	334	Actinomycin	Arch. Mikrobiol., **18,** 327, 1953.
sp.	X-45	Actinomycin B complex	Nature, **164,** 830, 1949; Arch. Biochem., **23,** 503, 1949; J. Chem. Soc., **1952,** 2672; **1957,** 1592, 1602.
sp.	Merck 6009	Actinomycin (X) B	Science, **120,** 389, 1954; Antibiotics & Chemotherapy, **4,** 1050, 1954; **5,** 409, 1955; **5,** 417, 1955
sp.	100	Actinorhodine	Naturwiss., **34,** 190, 1947; Chem. Ber., **83,** 161, 1950.
sp.		Amidomycin	Bacteriol. Proc. Soc. Am. Bacteriologists, p. 70, 1957.
sp.	A-102	Antimycins A_1, A_2, A_3, and A_4	Phytopathology, **44,** 438, 1954.
sp.		Catenulin	Antibiotics & Chemotherapy, **2,** 460, 1952.
sp.	H-18	Chromogenin	J. Antibiotics (Japan), **2,** 550, 1948/49.
sp.	A-419	Chrysomycin	J. Bacteriol., **69,** 280, 1955.
sp.		Ferroverdin	Nature, **176,** 645, 1955.
sp.	A 116-IAUR	Humicina	Anais soc. biol. Pernambuco, **14,** 146, 1956.
sp.	H-2053	Luteomycin-like antibiotic	J. Antibiotics (Japan), **6B,** 1, 1953.
sp.	Meredith's	Musarin + monomycin	Phytopathology, **33,** 403, 1943; **34,** 426, 1944; Nature, **156,** 781, 1945; **159,** 100, 1947; J. Gen. Microbiol., **2,** 111, 1948; Manufacturing Chemist, **22,** 47, 1951.
sp.		Antibiotic T-1384 (netropsin, congocidin, sinanomycin)	Abstr. 131st Meeting, Am. Chem. Soc., pp. 21N, 22N, and 23N, 1957; J. Am. Chem. Soc., **79,** 1265 and 1266, 1957.
sp.	T 3248	Oxytetracycline	Ann. pharm. franç., **12,** 440, 1954.
sp.	843-1	Phleomycin + antibacterial antibiotic + trichomycin-ascosin-candicidin type antibiotic	J. Antibiotics (Japan), **9A,** 82, 1956.
sp.		Primycin	Nature, **174,** 1105, 1954.
sp.	964-A	Protocidine	J. Antibiotics (Japan), **10A,** 128, 1957.
sp.	H-277	Roseothricin + 2 unnamed antibiotics	J. Antibiotics (Japan), **5,** 248, 1952; **5,** 522, 1952; **7B,** 228, 1954.
sp.		Streptocardin	Antibiotics Ann., **1953/54,** p. 177.
sp. 218	79	Streptothricin type 1	J. Antibiotics (Japan), **4,** 183, 1951.
sp.		Sulfocidin	Abstr. 5th Antibiotic Symposium, 1957.

SECTION POSITION UNKNOWN—*Concluded*

Epithet	Strain Number	Metabolic Product(s) or Activity	Reference
		SERIES UNKNOWN—*Concluded*	
sp.		Telomycin	Abstr. 5th Antibiotic Symposium, 1957.
sp.	H-1116, H-1119, and H-1143	Xanthomycin-like antibiotic	J. Antibiotics (Japan), **4,** 467, 1951; **5,** 451, 1952.
sp.		Antibiotic PA 132	Abstr. 4th Antibiotic Symposium, 1956; Antibiotics Ann., **1956/57,** p. 672.
sp.		Antibiotic PA 150	Abstr. 5th Antibiotic Symposium, 1957.
sp.		Antibiotic PA 153	*Ibid.*
sp.		Antibiotic PA 166	*Ibid.*
sp.	MD-2428	Steroid conversion	J. Am. Chem. Soc., **74,** 2126, 1952.
sp.	ETH 7747	Steroid conversion	Helv. Chim. Acta, **37,** 321, 1954.
sp.	A-220, A-548, A-560, A-717, and A-1111	Unidentified antiviral antibiotics	Antibiotics & Chemotherapy, **4,** 380, 1954.
sp.	A-809	Unidentified basic antibiotic	J. Antibiotics (Japan), **3,** 435, 1949/50.
sp.	E-150	Antibiotic E-150 substance	J. Antibiotics (Japan), **8A,** 189, 1955.
sp.	S.K.C.C. 1377	Unidentified antibiotic	Bacteriol. Proc. Soc. Am. Bacteriologists, p. 26, 1952.
sp.	X-206, X-464, and X-537A	Antibiotics X-206, X-464, and X-537A	J. Am. Chem. Soc., **73,** 5295, 1951.
sp.		Chitinase	Bacteriol. Proc. Soc. Am. Bacteriologists, p. 122, 1957.

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